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Plant Breeding.

There seems to be little doubt that the future of agriculture, and especially of tropical agriculture, is in the hands of the skilled scientific breeder of plants. We have good reason for saying tropical agriculture especially, because the field is here so much more open than in the case of temperate cultivation, in which, too, a large proportion of the possible improvement has already been effected.

This breeding of improved strains of useful plants is a form of work which cannot be taken up with any advantage by the individual cultivator. Even the owner of large estates has neither the time nor space for such experiments, supposing that he had the patience to face the probable failure of numerous individual trials. On the other hand, experiments of this kind are among the most important functions of any properly equipped central department of agriculture and horticulture. The Governments of most tropical and sub-tropical countries are now beginning to wake up to this condition of affairs, and in Java, in India, and in Egypt experiments in breeding the most important agricultural products proper to these different countries have already been for some time in progress.

For once Ceylon has been behind-hand in a matter of agricultural importance, though some experiments were carried out in 1903-4, but we hope that, with the arrival of Mr. Lock, who is a specialist in plant breeding, the colony will soon overtake its rivals. Future success in agriculture will lie largely in this line of work.

The interest shown by the inhabitants of Ceylon in the improvement of their own crops is scarcely what it should be. Improvement may be effected by better methods of cultivation, and by introducing better strains of plants from other countries. But the most valuable of all methods of improvement lies in the breeding of new and improved strains on the spot, starting from the existing strains already long established. This method, however difficult it may be of accomplishment, has the advantage of leading to an improvement which is permanent, whereas in the case of the others the benefit lasts only so long as the means of improvement continue in operation.

GUMS, RESINS, SAPS, AND EXUDATIONS.

RUBBER SAMPLES FROM INDIA.

PARA RUBBER FROM MERGUI, BURMA.

This sample of Para rubber (*Hevea brasiliensis*) was prepared from trees in the Government plantation at Mergui, and was forwarded to the Imperial Institute for examination and valuation. The sample weighed 49 grams, and consisted of two thin sheets of pale rubber, which was clean and well prepared. The physical properties of the rubber were very satisfactory.

A chemical examination furnished the following results:—

	Per cent.
Moisture	0·5
Caoutchouc	95·2
Resin	1·6
Proteid	2·4
Ash	0·3

The rubber was valued a 5s. 6d. per lb. in London, fine hard Para from South America being quoted on the same day at 5s. 2d. per lb., and Para biscuits from Ceylon and the Federated Malay States at 5s. 6d. per lb.

This rubber is of excellent quality, and compares favourably in composition and physical properties with sample of Para rubber from Ceylon and the Federated Malay States. Consignments of similar character would find a ready sale at good prices.

CRYPTOSTEGIA GRANDIFLORA RUBBER FROM INDIA.

Three samples of the rubber of *Cryptostegia grandiflora*, received from India, have been examined at the Imperial Institute, and the following summary of the results may be given:—

SAMPLE FROM MADRAS.

This sample consisted of three flattened cakes, weighin ogether about 1 lb. They were dark brown externally, but much lighter and slightly porous within; the pores contained a small amount of uncoagulated latex and a quantity of dark-brown liquid having an acid reaction; a little vegetable impurity was also present. The rubber on arrival was soft but not sticky, very elastic, and possessed fair tenacity. After keeping for some time, however, it hardened a little and then exhibited a tendency to tear when stretched.

A chemical examination gave the following results:—

	Sample as received. Per cent.	Calculated for dry material. Per cent.
Moisture ...	24·7	—
Caoutchouc ...	67·4	89·5
Resin ...	5·9	7·9
Insoluble impurity	2·0	2·6

It will be seen from these figures that the rubber is of very fair quality, the dry material containing 7·9 per cent. of resin and 89·5 per cent. of caoutchouc. The amount of moisture in the sample as received was excessive, but this could be remedied by more careful preparation.

A sample of the rubber, together with a statement of the above results, was submitted for commercial valuation to brokers, who reported that it would be worth about 2s. 4d. per lb. in London (August, 1903).

SAMPLE FROM JALAUN.

This sample was an irregular mass of rubber, almost black throughout, porous but quite dry, and contained fragments of bark distributed through it. The rubber was rather soft and slightly sticky; it exhibited very fair elasticity but was somewhat deficient in tenacity. As in the case of the specimen from Madras the tenacity of the rubber diminished on keeping.

An analysis gave the following results:—

	Sample as received. Per cent.	Calculated for dry material. Per cent.
Moisture ...	5·5	—
Caoutchouc ...	79·9	84·5
Resin ...	8·5	9·0
Insoluble impurity	6·1	6·5

The sample from Jalaun therefore contained more resin and foreign matter than that from Madars, and its physical characters were not quite so satisfactory. The brokers to whom it was submitted valued it at 1s. 6d. per lb. compared with 2s. 4d. per lb. for the Madras specimen.

SAMPLE FROM BOMBAY.

It is stated that the climbing plant *Cryptostegia grandiflora* is very common in the Bombay Presidency, and that if the rubber is of marketable quality large supplies could be obtained.

The sample weighed about 13 ounces, and consisted of a large porous lump of rubber which had been formed apparently by the aggregation of thin sheets and scrap. It was dark coloured, slightly sticky, and contained a considerable quantity of vegetable and mineral impurities. The rubber exhibited very fair elasticity and tenacity.

The rubber was found to have the following percentage composition :—

	Per cent.
Moisture	3·6
Caoutchouc	64·3
Resin	10·1
Albuminoid matter ...	7·9
Insoluble matter (including ash)	*14·1*
Ash	8·22

The percentage of resin and albuminoid matter are both high, but the chief defect of the rubber is the presence of the large amount of insoluble matter, consisting of vegetable and mineral impurities. The presence of mineral impurity points to the contamination of the rubber, possibly the scrap rubber present in the sample, by contact with the soil, and precautions should be taken to avoid this in future. The percentage of caoutchouc is rather low, but this is chiefly due to the excessive amount of the impurities contained in the present sample.

A sample of the rubber was submitted for valuation to brokers, who reported that it was rather sticky and slightly heated, and would probably be worth 3s. 6d. per lb. in London (May, 1906), when fine hard Para from South America was quoted at 5s. 4d. per lb.—*Bulletin of the Imperial Institute,* Vol. V., No. 4.

RUBBER PRICES.

The following article is so well worth careful attention locally, that we venture to reprint it from the *India Rubber World* of New York :—

THE COST OF AMAZON RUBBER.

No question in connection with crude rubber is of more commanding interest to-day than the probable effect of a large production from plantations upon ultimate prices of staple rubber grades. Five years ago such a question would not have had respectful attention outside the then narrow circle of rubber planters. The rapid increase in the output of rubber plantations of late, however, has made a marked impression even in Stock Exchange circles in London, in which city the leading financial journals give relatively as much attention to rubber as to railway or mining interests.

It may be said, of course, that rubber planting commands so much attention because it is the newest marked success with which investing interests have been concerned. But it has been proved that rubber can be produced under cultivation with as much certainty as wheat or cotton, and the fact that the forest product in recent years has been sold to factories at as much as $3,000 per ton, while steel has been produced at not above $3·30 for the same weight, has rendered most alluring the possibility of cheapening the cost of production of rubber without wholly upsetting the long maintained price levels. In fact, it has been possible to draw a most spectacular picture of the near future of rubber planting profits.

But just as a thousand or so tons of cultivated rubber began to be produced, along with say 70,000 tons a year of the forest product, an unexampled drop in prices occurred, and investors in plantations naturally have been disturbed. The exact cause of the drop remains yet to be understood; up to date nobody seems to be able to fully understand what sent rubber up or down, or "where prices are made." At every meeting of a Planters' Association in Ceylon it is gravely stated that the lower prices to-day are due to something having happened in America.

But that is because the planters in Ceylon are British. Ten years ago, or five years ago, whenever crude rubber prices went up, London and Liverpool dealers told their customers it was because "something had happened in America." But all the while every American who cared a snap of his fingers about the situation blamed everything upon England or some other country, and at this moment the same thing is true —in every market it is said that rubber has gone up or down because of conditions somewhere else. And there you are.

The United States has not ceased to buy rubber. Look at these figures, showing the Government statement of the quantity and value of rubber—total and average per pound—imported into the United States during ten calendar years past :—

Year.	Pounds.	Value $	Per lb.
1898 ...	44,236,070	25,937,108	56 cents.
1899 ...	54,408,495	34,219,019	63 do
1900 ...	49,337,183	28,577,789	58 do
1901 ...	55,152,810	28,120,218	51 do
1902 ...	50,851,257	25,158,591	49 do
1903 ...	55,744,120	35,152,642	63 do
1904 ...	61,889,758	43,784,297	71 do
1905 ...	64,147,701	48,517,906	76 do
1906 ...	67,907,251	53,391,137	79 do
1907 ...	68,625,647	49,797,437	73 do

New York is not, like some other rubber markets, an international clearing house for rubber; for the most part whatever supplies come into this port go promptly into the hands of home manufacturers. The recent decline in prices does not therefore depend alone upon conditions on this side of the Atlantic any more than upon conditions on the other side, or in regions less discussed in this connection. It will be seen from the same table that prices have fluctuated, without regard to the volume of rubber imports (practically the volume of rubber consumption in) into the United States.

But this article is not intended as an apology for, or a defence of, New York, and still less as an explanation of the influences that cause rubber to sell now higher and now lower. The immediate pressing question in Ceylon and other planting regions is: At what point of decline will the Amazon regions cease to export rubber, and thereby leave the prospective planting interest in command of the field?

Our opinion is that the Amazon river will carry rubber to market for very many years after every rubber planter now alive has been gathered to his fathers. Nobody knows what it costs to produce *Hevea* rubber in South America, unless it be an exceptional owner of a *seringal* here and there who troubles himself to keep books. And the Brazilian who admits to himself that the sun rises or sets outside his country, or that *good* rubber can be produced elsewhere, is no patriot. Do not the cotton planters of the United States rest under the same delusion regarding their own special product? What is the use, they would say, of considering the possibility of competition, and planning how to meet it?

There are rubber manufacturers in the United States to-day who remember when fine "Para" cost them only 25 cents (a shilling) a pound, and there never was any scarcity of raw material. Of course, with the growth of demand prices went up, which was natural, and the consumer did not complain. But it is impossible to fix a limit of price below which the Brazilian and their neighbours will not produce rubber. Whatever was true at an earlier date, most of the *seringueiros* of to-day have got to produce rubber, *or starve*. Their country as yet affords no other export staple—no other means of subsistence. The Ceylon planters whose enterprise fails can go "home," or somewhere else. But the Amazon rubber gatherer must gather rubber or die, and if the high prices of recent years which have amazed him and led him into extravagances, and to feel that Amazonia had "the world in a sling" should disappear permanently, he would still gather rubber and manage to sustain life on the proceeds.

This is not written to discourage the rubber planter. The world will continue to use rubber more and more. The world as a whole is only on the threshold of using rubber as a general proposition. But it is idle as yet for a few bookkeepers to try to figure out what forest rubber "costs"—whether on the Amazon or on the Congo—and at what minimum of cost it will cease to be marketed. There are shrewd business men on the Amazon as elsewhere, only they have not yet been forced to apply system to their accounting. When they are, the European shareholders in companies in the Far East must see to it that their directors are not worsted in the competition. Have we not seen millions of European capital invested in exploiting forest rubber in South America, and almost invariably at a loss? But the rubber output of the Amazon has gone on increasing year after year, and it is incredible that the people who have produced this great volume of exports have done so at a steady loss. So far the Brazilians as business men have not suffered by comparison with any competitors.

The real question is not,—"At what low figures will Brazil stop producing rubber?" but "How cheaply can anybody else supply equally good rubber?"—*The India Rubber World,* Vol. XXXVII, No. 1, April 1, 1908.

CEARA OR MANICOBA RUBBER.*

INSTRUCTIONS FOR ITS CULTURE AND EXTRACTION OF RUBBER.

Owing to its easy acclimatisation and small requirements with respect to soil, Manicoba will become a product of great importance, coming next to that of coffee, to-day so depreciated in its market value.

It requires, however, constant care and work.

Certain plants do not consititute what might be looked upon as capital,—they ripen in a few months and then disappear; others like coffee, cocoa; and the Manicoba represent a real income owing to their being long lived.

It is therefore on account of its great interest that we endeavour to make

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* Translated from Boletin; Sec. de Agricultura, &c., Bahia, II, 2nd Aug. 1903, We are indebted for the translation to Mr. D. A. Wetheral.—*Editor.*

known some particulars of this most useful plant. Showing how its plantation should be made, how it should be treated, and the manner of extracting the rubber. This is what we intend to do, making use of other works already issued, intending to add to them without damaging their clearness.

THE TREE.

The Manicoba (*Manihot Glaziovii*) belongs to the family of Euphorbiaceæ, to which also belong *Hevea brasiliensis* which produces the excellent rubber of the Amazon.

It grows not only in the interior, but also near the sea, and on mountain sides, doing well in the pastures ranging between 15°C. and 32°C. [59°F. and 70°F.] that is all over Brazil.

It is probable that its habitat covers a great part of the country periodically destroyed by drought, from the banks of the river San Francisco to those of the Parahyba.

As to the condition of the soil in which it vegetates, it seems that the Manicoba requires little, doing better in clay lightly mixed with sand.

The resistance of the plant to extreme drought, and at the same time its suitability to well irrigated and fresh earth cannot be explained. On dry table lands of hard clay fine and luxuriant examples of the Manicoba are raised.

Only on the sandy earths of beaches where the air is always damp the plant will vegetate quickly.

The hygrometrical state of the temperature will make the plant commence in the production of "latex," immediately after the winter, in the months of May and June. This flow of liquid, thin, and without consistence, is easily taken in "Flanders tin cans," in which it coagulates within 4 to 6 hours.

The amount which the dry season advances, rarefies the milky secretion, and from flowing it passes to dropping, coagulating rapidly on coming in contact with the atmosphere.

The latex is a liquid of glutinous consistency, made up of two elements, one liquid hardly coloured, the other very fine globules unequal, and of varying colour, which swim in the liquid. The circulation seems to be descending, and is favourable to the nutritive moisture; as to the form of these milky vessels, they are simple on ramified tubes, completely closed, of transparent walls, and without any appearance of punctuation or of transversal lines.

The latex which produces the rubber is different to the sappy or nutritive moisture of the plant, and unless there be some means of invigorating the latex, then the belief of the explorators of the Seringuera, or the Manicoba, that the extraction of the milk weakens the tree is not unreasonable. The wood of the Manicoba is spongy, light, white. The Cupim (insect of Brazil) attacks the wood as it does white pine. Giant trees do not resist the undermining by the Cupim for more than one year, and when the first high wind comes they fall, throwing sometimes to the ground the shoots, which take root and form new growths, at other times in the falling the seeds get scattered and quantities of plants spring up. The tree of the Manicoba attains a height of 30 feet, it has a round shape, and its leaves are similar to those of the Mamoa tree and of an ashy green colour.

PLANTING MANICOBA.

The seed is hard, flat and smooth, nearly the size of a matured coca cob, of dark olive colour. Its hardness is extraordinary, resisting very heavy compressions, also its permeability to water, in which it may remain for a long time without putrefying or saturating. Without doubt because of this circumstance some planters lay them in a bed of sand, covering them with straw, thus parching them superficially. The hard scab of the seed dilates and splits, then on transplanting it grows easily.

This process is dangerous as it is liable to expose the germ of the plant; it is preferable to make a plantation in a nursery and transplant after, as is the custom with coffee trees.

Planting by cuttings does not offer any real advantage and can only be attempted with any result when the first rains of the year are over. For besides maiming the vigorous shoot of the mother plant, it is difficult for the cuttings to take root, and even after they have taken root, they resist but poorly any variations of the summer on the hills, but in damp districts, which are never really wet, this system is perhaps better, so as to hurry the development of the plant, and consequently for its industrial profit. In any case it does not do for an extensive cultivation.

When care is taken to choose the seeds, avoiding those which float on the water, the plant comes up robustly, looking whilst young like "Ricinus" (Castor oil plant) or "Manioca" (Cassava).

During the first three or four weeks it grows from 8 to 12 inches, going ahead from then rapidly, attaining three

or four metres in the year, if the soil is readily damp, as upon the sides of the mountains.

In the interior the development is slower, it is therefore planted in the summer so as to be nourished in the winter. Cattle like the young Manicoba for forage, therefore it should be planted within closed places.

Some planters think that the Manicoba does not require care, it being sufficient to make a clearance after the first year and onward, others think that this idea is quite wrong.

Snr. Adriene Delpeche says as follows:—

In the month of August I moved twenty roots; the first, which were sown in a corner for experiment at one month old, had attained a height of 15 centimetres. Half were planted in a piece of ground sown with millet which was not weeded again. The other half were planted in a piece of ground which was always kept clean.

Result—The former are 30 centimetres (12 inches) high and are very fine. The latter measure upwards of 2 metres ($6\frac{1}{2}$ feet), one being 5 centimetres (2 inches) in diameter, having already vertical branches.

The enemies of the plant are the following:—

Immediately the plant shows the young stalk, ants of every kind, large and small, destroy it, becoming most hurtful to every plant which is not in a nursery, where they may be carefully watched and guarded.

Then there is the sap which attracts the destructive insects to attack the slips of plants transplanted from the nursery, cutting in an instant innumerable leaves.

In the third year the cuttings of plants may be thinned as so may many of the seeds from fresh places. In the interior only with the fifth year or sixth year is it apt to produce, it being imprudent to tap before owing to the poor resistance of the trunk. It has been observed that Manicoba, thinned, even when young and tender, three or four years old, acquires strength quickly, distancing itself rapidly from its mates left alone.

The influence it has on the growth of the plant is as yet unknown, it should be an object of keen investigation.

The tree accommodates itself in a space relatively restricted, not requiring more than 2 metres or $2\frac{1}{2}$ metres ($6\frac{1}{2}$ to 8 feet) distance between one another. It bends little and its shoots grow vertically.

The agriculturist, H. Lember, wrote the following about the manner of planting Manicoba:—

To accelerate the natural germination, which lasts one year or more, it is necessary to scrape (file) the two rounded extremes of the seed, whose shell is very hard; this operation requires great care so as not to interfere with the shoot.

The seeds are then planted in an open bed, at a distance from one another of 3 inches, covering them with about half an inch of soil, watering twice ordinarily if no rain. The bed should be well exposed to the sun, shade spoils the seed. At the end of three or four weeks there appear the first shoots, when they do not require any more special care, and they can be transplanted to their definite places when they have attained the height of one foot.

Those who do not care to go to this trouble of scraping the seeds, may leave them to soak in water for six days, then sow them.

In this case the germination commences after four weeks and will be ended after three or four months. The transplantation may be made from cuttings of new sprigs, which easily attain roots so long as one eye is left above the soil.

Extraction of Milk from Manicoba and the Preparation of Rubber.

The Commission appointed by Government for the study of Manicoba found in different zones of this State, in their report describes the following different methods employed for the extraction of the milk:—

In the Manicoba and in most of the plants of the family of Euphorbiaceæ, the latex contained in the bark by the laticiferous vessels from the roots to the leaves and fruit having the colour of sulphur of orange according to the exposure to the sun's rays, we noted a variety of the milk which was white.

At the branches and roots, the milk appears in abundance, principally the latter. We encountered also latex in the pith.

Properties of the Milk.

When the bark is cut the milk exudes, giving out a smell of cyanoge acid, similar to Manioca, coagulating rapidly under the action of oxygen, light and heat; it dries leaving on the bark a transparent layer which is easily detached in ribbon-like form, forming an excellent rubber. In mixture with

water it coagulates in two parts, one solid, forming caoutchouc, or rubber; the other in suspension with it, giving it a milky colour, and consisting of albuminoid and other substances.

The milk ferments quickly; this we believe is due to the albumen, and giving off a smell of suphydrate of ammonia, leaving the rubber intact, which gradually loses its colour through the development of the fermentation.

THE MOST APPROPRIATE TIME FOR TAKING THE MILK.

It is necessary to study the best time for tapping from two different points of view, principally :—

1. To obtain the greatest quantity of the product.

2. Not to damage the plant for future production.

In all the plants the circulation takes place with more or less activity in accordance with the seasons and the local climate.

In cold climates the sap remains paralyzed during the winter season. In hot and damp climates the sap is always in activity, increasing the circulation as the temperature rises, through the accumulation of the vapours in the atmosphere.

In hot and dry climates, part of the year the sap lies paralyzed on account of the liquid necessary to serve as a vehicle to the principal nutritives.

In our country we look upon two principal zones for the culture of Manicoba, one hot and dry, the other hot and damp.

In the first, the circulation of the sap becomes active from October forward until April.

In the second, in spite of the rain in June, the activity takes place from September to January, the storm season.

It is in this season, therefore, that the ascending movement of the sap takes place in the Manicoba with all activity, carrying in solution the principles which, on reaching the leaves have to endure the action of the oxygen, so that after they are elaborated, they descend, renovating and creating new tissues, surcharging itself with the principles in excess, which are naturally expelled through the bark by ruptures or by the attack of insects. Therefore after one or two months the plant is replete with sap and with milk.

BEST TIME FOR COLLECTING.

The best time to commence taking in "the hot and dry zone" is between October and April, when the plant is in full vigour, and rich in "elaborate" principles establishing by the extraction of milk as if a continuous action were taking place by the defalcations and obliging the plant to refill this want, absorbing new elements and encountering with soil the water necessary for this substitution. This cannot take place from May to October, in which season owing to the want of water necessary to the vegetation, it cannot expel with ease the very thick principles contained in the laticiferous vessels.

In the "hot and damp zone" where the vegetation is always in activity, the best season for collecting should be in the summer, from September to January, when the sap is "ripe," but in which season there is no want of water from the storms to give the necessary vehicle to the nutritive principles and to the materials which have to be excreted.

EXTRACTION OF MILK.

The only parts in the Manicoba which can serve for the extraction of the milk are roots and the branches; the latter, although they contain a great quantity of milk, present many drawbacks to the extraction, and endanger the life of the plant. These drawbacks are :—

1. The cuts, or any furrows made on the bark, interrupt at these points the circulation of the descending sap.
2. The great exposure to the sun aggravates these wounds by a quick drying up and by the rapid coagulation of the milk.
3. The difficulty in adapting the vessels.

In Manicoba the tap root is the part which offers the greatest advantages to the production of milk, both in abundance, and the easy flow thereof, also by the employment of the best methods of extraction, and for giving an almost continuous supply.

DIFFERENT WAYS EMPLOYED IN THE EXTRACTION OF MILK.

First Process.—Dig the earth at the side of the plant to the right or left, leaving uncovered the vital knot and tap root, by the help of a knife or any other instrument of bone or horn, pointed, work below the vital knot or at the point of union of the branches and roots, on the tap root or secondary root; make a small orifice on the bark lightly without touching the wood, raise

the bark or round off the orifice so as to leave it clean. Through this orifice will the latex flow and deposit itself in the cavity opened in the soil, coagulating impregnated with earth, thus losing in its value according to the greater or less percentage of earth.

Second Process.—In the same way as the first, make the hole in the soil at the side of the plant, clear the tap root without making any mound so as to avoid any falling of the earth ; this done, place at the bottom of the hole a trough or small basin made of clay or other earthenware, putting same close against the tap root ; having done this make one or more scratches in the root, and the milk will flow, accumulating in the basin and coagulating without mixture.

Third Process.—Extraction from branch. Although we are against the extraction from the branch, we explain the process which we think is the most wise, it being left to practice to ascertain which is the most profitable way.

Make small holes in different parts of the branch, and by the dripping and running of the milk it is easily seen where to place the cups, then by means of a piece of string (perhaps it would be better to use zinc wire) hang the cups in such a way that they will be close up to the branch (when necessary), making a small cut in the bark so as to immerge the side of the small cup in such a manner that the greater part of the bark covers it, then make above the cup different furrows (the less the better) in such a manner that the milk will converge well thereinto. Cutting the tree unnecessarily should be avoided as it spoils the tree without giving any result.

In the Manicoba (be it the root or branches) the smaller the orifice made in the bark the greater the production of milk—great care must be taken not to damage the wood.

Other methods employed to improve on the three descriptions given :—

First Process.—The use of water as a coagulator. In either of the processes fill the basin with water which will coagulate the milk in such a manner that sand and heavy substances will remain at the bottom of the vessel, and the light ones will float without adhering to the rubber, so that coagulating in the water it becomes separated from foreign bodies.

Rubber coagulated in water presents a splendid colour becoming pure and fresh, separating itself from that which gives the water a milky colour.

In spite of these good qualities we notice that the rubber continues to ferment, losing its fine natural colour, becoming dark and acquiring an unpleasant smell which obliges us to neutralize the fermentation and preserving its qualities.

Second Process.—In place of pure water use a solution of alum and with it fill the basins.

In our experience, we made a solution of alum in a glass vessel, and scratching the tree we allowed the milk to fall drop by drop into the solution ; on coming in contact with the solution it coagulated rapidly—making the same effect as the drippings from a candle would make upon water, without changing its natural colour, producing a greater quantity of coagulation, and giving a rubber of the best quality and of orange colour.

Third Process.—We also used chloride of soda (kitchen salt) making a weak solution, and as in the second process we allowed the milk to fall drop by drop, this time instead of coagulating it remained fluid, notwithstanding that the percentage of milk had been raised. Eventually it coagulated after a long time had elapsed, producing an excellent rubber the colour of sulphur.

The manner of adopting these two processes. Having to adopt either of these two processes you proceed as follows :—

Make a solution (if alum, sufficient to make a weak solution ; if salt, it should be saturated) with which the basins or troughs must be filled to receive the milk as in the other processes.

The quantity of the salt solution used may be used several times when the basins are substantial, so that they do not allow it to filter, they should also be covered so as to avoid rapid evaporation and the falling in of foreign bodies.

Which of these processes are preferable? It is clear that it depends on the form you desire to adopt in the preparation of the rubber. Should you require to obtain the milk in great quantities so as to coagulate and press it, the salt solution should be used, but not having the requisites then the alum process may be used. One of the advantages of these two processes is the paralyzing of the fermetation, preserving in the rubber all its natural qualities without the disagreeable smell. They have also the advantage that the rubber can be taken to the press whilst fresh, forming a homogenous body and of any size required to be adopted.—(*Bulletin of the Department of Agriculture. Jamaica,* Vol. VI, January, 1908, Part I.)

(To be continued.)

JAPANESE CAMPHOR.

The agency for the sale of camphor on behalf of the Japanese Government, which has been in the hands of Messrs. Samuel Samuel & Co., of Formosa, and the corresponding house of Messrs. M. Samuel & Co., of London, since the institution of the monopoly eight years ago, terminated this week, it being the desire (as we stated last December) of the Japanese Government to conduct the business on their own account and to place themselves in touch with the customers. So much misconception, however, has prevailed, especially in the United States, as to why Messrs. Samuel's services were to be dispensed with, that it should at once be stated that this well-known house had carried on the business in a manner entirely satisfactory to the Government, and that they were in no way to blame for the fact that the prices paid by manufacturing consumers in America were much above those paid by the importing houses. It may also be pointed out that all the business done by Messrs. Samuel was at the prices authorised by the Monopoly Bureau, and that they neither attempted nor were permitted to sell above the official fixed limit.

In view of the above developments and in order to obtain authoritative particulars in regard to the future method of distributing monopoly camphor, a representative of the *Chemist and Druggist* waited upon Mr. T. Masuzawa, who has established himself at the office of Messrs. Mitsui & Co., 34, Lime Street, E.C. Mr. Masuzawa is in the employ of the Imperial Japanese Government, and is Commissioner of the Monopoly Bureau. Asked as to the chief reasons which influenced the Government in making this new departure, Mr. Masuzawa replied that they desire to obtain a better grip of the business by coming into direct relations with the buyers themselves, studying their requirements in every possible way, and endeavouring to maintain prices with as few fluctuations as possible consistent with supply and demand. This is a point which celluloid manufacturers and consumers will appreciate, as under the new *regime*, speculation, which was the bugbear of the monopoly in the early years of its existence, has been entirely eliminated so far as monopoly camphor is concerned. Indeed, the Government were entirely opposed to the speculative spirit from the beginning; but they were not able to cope with it successfully when the supplies of crude ran short, and refined camphor went to a famine-price. "Now the position is entirely altered," continued Mr. Masuzawa, "as we can supply everybody, even when the China supply has given out, or the synthetic camphor driven off the market. There is therefore no possibility of prices again reaching a prohibitive figure, it being the endeavour of the Government to protect the buyer as far as possible, while trust methods will not be countenanced." In future all contracts will be made with Messrs. Mitsui & Co. (as selling representatives of the Government), under the direct supervision and with the approval of Mr. Masuzawa. The prices will be fixed as they were with Messrs. Samuel, and although there is no likelihood of camphor being cheaper under the new control, the principal object will be to regulate the supply in accordance with the requirements of each customer.

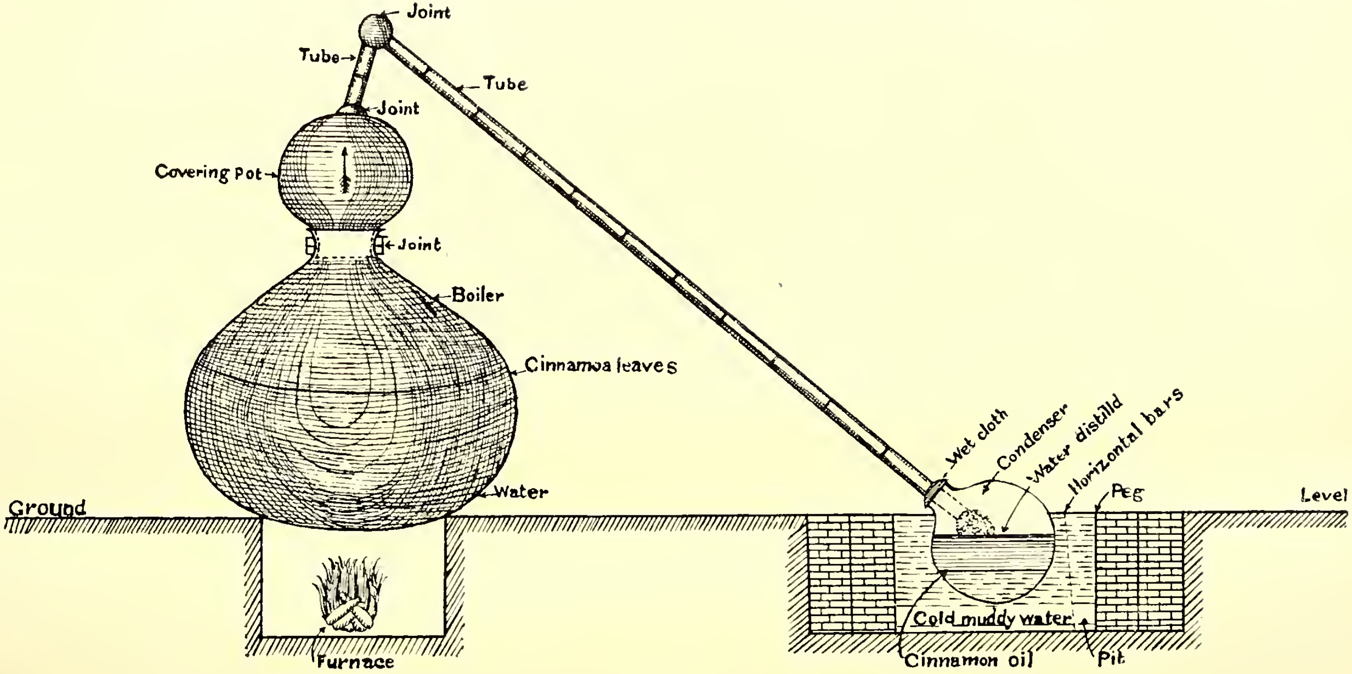
"You have no doubt heard much about the competition with China camphor. In what way does this affect the monopoly product?" our representative asked. To this Mr. Masuzawa replied: "Yes, we are fully aware of what China is doing; but we do not regard their competition as serious, as the quality varies considerably, and is not to be compared with the Formosan article. For our part the Government sold a considerable quantity of the monoply product last year for shipment up to March, and the fact that so little business has been done this year is practically due to the depressed condition of the celluloid industry."

Asked as to the possibility of Japan obtaining control of the China output, Mr. Masuzawa pointed out that such a course is unnecessary, and would not be advantageous. Conditions in China are entirely different from those in Formosa and Japan. In China the camphor-trees are sparsely scattered over a large area, so that transport is expensive, while the price demanded for each tree varies according to the whim of the owner. Many trees are found planted round shrines and temples as a wind-protection, and are difficult to purchase on account of the intense religious feeling which prevails. In Formosa, however, the trees are the property of the Government, and the work of reafforestation is constantly going on.

Last year Chinese camphor touched 370s. per cwt. and over, these high prices stimulating the production, but on the basis of present prices, which are in the neighbourhood of 160s. to 162s. 6d., the output is now considerably less. The exports from Formosa and Japan mainland amounted to about 40,000 piculs in 1906, rising to about 50,000 piculs in

1907, and in all probability these figures will be maintained this year, the endeavour, as already stated, being to keep the supply just equal to the demand, without any over-production. It appears that the aborigines in Formosa have not yet been entirely subjugated, but last year quite a large area of camphor-trees was wrested from them. Isolated attacks on the camphor-distillers are of common occurrence and will probably always happen. The replanting of camphor-trees is steadily taking place in Formosa, and Mr. Masuzawa stated that last year over one million trees were planted out. An equal number is to be planted this year, the aim of the Government being to continue the industry indefinitely.

Mr. Masuzawa has just concluded a tour on the Continent where he visited Paris, Oyonnax, Mannheim, Leipzig, Cologne, Speyer, Hamburg, and other industrial centres, with the object of interviewing the leading buyers, whose purchases will be controlled from London, the only other Monopoly Bureau office being in New York, where Mr. Kintaro Tani is in charge. Mr. Masuzawa is quite satisfied with the results of his labours.—*The Chemist and Druggist*, No. 1, 473, Vol. LXXII, April, 1908.



APPARATUS FOR DISTILLATION OF CINNAMON OIL: FROM A SKETCH BY R. GOPALIAH.

OILS AND FATS.

DISTILLATION OF CINNAMON OIL.

(Illustrated.)

The apparatus used for distillation of this oil consists of three earthen pots, serving as boiler, covering pot and receiver, with two short tubes of bamboo to conduct the steam from the boiler to the condenser. The large earthen pot which acts as boiler is placed over a furnace; water is poured into it to a depth of nine inches. Fairly matured green leaves of *Cinnamomum Tamala* are packed into it. One head-load of leaves will fill the boiler twice. A small earthen pot (chatti) is kept with its mouth down over the boiler, the joint being well plastered with clay and cowdung mixed. A small bamboo tube (wate) about a foot long and half an inch in diameter is thrust through a hole in the top of the upper pot as shown in Plate 2. To the free end of this tube another about three feet in length is attached, the two joints being wrapped up in cloth and plastered well with the clay mixture. The longer is led into another earthen pot called the condenser which is fixed in a tank containing cold muddy water. The condenser is kept down by means of horizontal bars passing over its neck, the bars being pegged down to the ground. A thick wet cloth is spread over the mouth of the condenser and around the bamboo tube. The muddy water is replaced as soon as it gets heated by the steam.

The process consists of heating water in the boiler to boiling point. The steam given off absorbs the oil from the cinnamon leaves. It passes through the bamboo tubes into the condenser and is there condensed against the cool sides. The oil being heavier than water sinks to the bottom, while the distilled water forms the upper layer.

The process takes about 8 to 12 hours yielding from half to one seer of good oil (1 seer=24 tolas.) The oil is used for medicine and is largely exported to cold countries. The market price of the oil in South and North Kanara varies from eight to twelve annas per seer.

The rate of royalty for each still (bhatti) is six rupees per annum. The working season lasts only for five months, from November to March. After this the young leaves appear, and these would not yield sufficient oil to repay the labour.

The apparatus used in the manufacture of this oil, though rude, is simple and lasts a long time. The distillation process is confined to the Western Ghats, where there is an abundant supply of leaves of Cinnamomum.

B. GOPALIAH, D.D.R.,

Range Forest Officer.

Thirthali Range, Mysore State.

—*The Indian Forester*, Vol, XXXIV, February, 1908, No. 2).

DRUGS AND MEDICINAL PLANTS.

COCA.

By G. Van der Sleen.

(Ind. Merc. 25, 2, 1908, p. 127, reviewed by J. C. Willis.)

Coca comes on the market as Huanuco, Truxillo, Cuzco, Bolivia, Ceylon, and Java, but may for practical purposes be divided into large—and small—leafed. In 1901 there were shipped from Peru 610,000 kilos (1,500,000 lbs.) of coca-leaves, and 10,680 kilos of cocaine, valued at about £320,000, a total which compares favourably with Java cinchona.

Java according to this author grows only the small-leafed coca, which contains almost no cocaine. Early analyses showed that it contained 2·20 per cent. of alkaloid, but this was not cocaine. To the small-leafed Java kind he identifies as *Erythroxylon truxillense*, Rusby, the large-leafed as *E. Coca*, Lamarck, the true coca.

The rest of the article is devoted to a polemic on the subject. Ceylon generally grows the large-leafed coca, which appears to give more cocaine.

EDIBLE PRODUCTS.

PINE-APPLE GROWING IN THE WEST INDIES.*

By G. L. Lucas.

The growing for export of pine-apples in the West Indies has never been successfully accomplished, except in the Bahamas and in the Island of Cuba.

The Bahamas for many years were large producers and exporters of pine-apples. All the fruits were sent to Baltimore in schooners in bulk to the canning factories, but of late years the industry has steadily failed, until now the shipments from these islands have become small.

The Bahamas islands are composed of coral rocks, and the little soil at any time could be only found in the crevices of these rocks. Repeated plantings have exhausted what little soil there was, until now the planter in these islands is confronted with the problem of how to continue an industry that at one time proved so profitable.

The Government some years ago passed a law forbidding the exportation of any more pine-apple plants, hoping by this means to save the declining industry, but government laws have failed, because it was the exhaustion of the soil and not the loss of plants that was responsible for the decline.

Florida, in 1883, produced no pine-apples except on the outlying keys from which, like the Bahamas, the produce was shipped in bulk to Baltimore in schooners to the canneries. In 1884, the few settlers on the eastern mainland of Florida began the experimental planting of suckers that were obtained from the Florida keys. Later, as the business grew and the demand for plants increased, the Bahama Islands were drawn upon, many hundreds of thousands of plants found their way to Florida to commence the industry that to-day forms one of the principal sources of revenue of that State.

The Florida pine-apple grower in all these years has had many discouragements to contend with, and aside from poor soil, the greatest enemy has proved to be frost. With this menace constantly confronting it, the business has been kept in check, and no doubt will always be kept within certain bounds.

Cuba produces more pine-apples than Florida, the Bahamas, the West Indian Islands combined, and the export of this fruit is increasing rapidly every year. It pays the planter in Cuba to grow pine-apples because of the extremely fertile soil, and the frequent, cheap and quick transportation to the United States, where a reduction of 20 per cent. on the duties is allowed on this fruit. Little success could be expected from shipping fruit from the British West Indies to England with the present unsatisfactory means of transportation, for the reason that the journey is too long, freight rates are too high, and private shipments generally receive indifferent care by the transportation companies.

Jamaica enjoys direct communication with England by a subsidized line, but this line gives the greater amount of attention to the carriage of bananas, so as to fulfil its contracts with the English and Jamaican governments. Private shippers, therefore, receive secondary consideration, and experience in the past has shown that losses are frequently incurred. During the past three years, such have been the experience of those who have made earnest and repeated trials of private shipments, that now no individual shipments are made in the fruit line from Jamaica.

Probably the best way of establishing a profitable pine-apple business in Jamaica would be to build canning factories to utilise the fruit on the spot. This can be done by growers combining and erecting a modest factory. Encouragement should then be offered to others to grow good fruit, which would be purchased for cash delivered at the factory, at a price that will pay the grower handsomely and allow the factory to earn a fair percentage on the investment. There is always a good demand for canned pine-apples in England, and large shipments of such goods are sent from Singapore every year to both London and Liverpool. If Singapore can make the canning of pine-apples a profiable business, with its cheap labour, there are other advantages that are enjoyed by the West Indies that the East can never hope to have. I think that if this subject be given the consideration it deserves, a new industry that can be depended upon to yield revenue to many of the West India Islands would be the result.

A canning factory was erected in Jamaica in 1905, and it has given

*Reprinted from *West Indian Bulletin*, Vol. VIII, p. 151. For previous article by Mr. Lucas see Bulletin of Department of Agriculture, Vol. V, p. 41.

successful results. Many obstacles were encountered before the business could be made profitable; mistakes were made and losses incurred.*

Another canning factory is now being erected in Trinidad, which may prove a profitable investment to those who have had the courage to lay out their money in a new enterprise. Every encouragement should be given the promoters by the planters in Trinidad, who, if they planted largely, would find ready sale for all their fruit at remunerative prices.

Establishing Fields.

To establish a pine-apple plantation needs some knowledge as to the proper methods to follow, and although Cuba produces millions of fine pine-apples, the method of laying out fields in Cuba are somewhat crude.

The Cuban method is to plough the land, turn up ridges about 3 feet apart as for sweet potatoes, and then to plant the pine-apple suckers along the top of three ridges about 8 inches apart in the rows. This method of planting is not to be recommended, for the plants are too far apart between the rows and too close together in the rows. The plants receive no support from one another, and when they fruit, the weight causes them to turn over. In consequence, the fruit becomes sunburned, the plants become uprootod, and the suckers find much difficulty in striking their roots into the soil. The fields soon deteriorate, as the sun bakes the soil and burns the roots of the plants.

The Cuban possesses an idea of drainage, but his understanding of this necessary part of pine-apple cultivation is very crude, and it might be anticipated that if he only knew more about the proper cultivation of pine-apples, much better results would be obtained.

After twenty-four years devoted to the growing of pine-apples both in the sandy soils of Florida where no drainage is ever needed, and a long experience in Jamaica where the soils are heavy and where thorough drainage is absolutely necessary, I have to make the following observations for the guidance of those that are about to embark upon the cultivation of pine-apples:—

The prospective pine-apple grower should select his soil with the greatest care. The best soils are probably light loams, rich in humus. A heavy cold soil, or soil inclined to become sticky or gummy in wet weather should never be chosen. Look for what is a good scoring soil containing sufficient sand to make it pliable at all times, and it is advisable that it should slope gradually. Hilly parts should be passed by. First, the land should be thoroughly ploughed, then cross ploughed, and harrowed until it is thoroughly pulverized and freed from the smallest lumps. A wheel or disc harrow is the only tool that can get such land into proper condition. This should be followed by an Acme harrow which will smooth and level the land. A tooth harrow should not be used, for this tool only pulls out the grass and weeds, and brings to the surface trash, which is best left in the soil to assisting in enriching the land. After the land has been prepared, mark off with a line for trenches. These trenches should be 14 inches wide and 14 inches deep, and should follow the slope of the land in order to afford proper drainage. The trenches should be 12 feet apart, they should be made perfectly straight and in line, and all soil taken from them is best thrown equally on both sides in order to build up the beds. This soil, then, should be raked towards the centre of the beds and brought somewhat higher in the middle than at the sides, so as to allow a difference of about 6 inches between the height in the middle and that along the edge of the trenches. A fine-tooth steel rake should be used, and the beds should be made as smooth and even as possible.

When the trenches and beds have been completed, mark off each bed into checks 18 × 18 inches. This will give about nine rows along the beds. The cross checks should be made regularly except at intervals; two lines can be admitted so as to allow for paths. These marks should be made with a wooden marker, and they should be perfectly straight to facilitate subsequent cultivation. The plants are then dropped at the intersection of each mark. They are then ready for the planter, who with a good strong trowel follows along and sets the plant at each cross marked at a depth of one-fourth of their length. This depth of planting is to be recommended, no matter what the length of a plant. If planted to shallow, they will not become sufficiently rooted, and heavy winds will blow them out of the ground; and if planted too deeply they are liable to be smothered by having the soil filling the hearts. Suckers or slips that are longer than 12 inches can be lopped off and brought down to 8 inches so as to facilitate rapid planting and to prevent their being blown out of the ground before they have taken root. If the suckers are not planted in strictly

* The late earthquake destroyed all the stock of goods that had been made up, which happened to be stored in the city of Kingston.

straight rows each way, they should be pulled up and planted again. If the larbourer who plants them is charged for his mistakes, he will be more particular in future as to getting them perfectly straight.

CULTIVATION.

After the plants have been set out, they can be left alone for five to six weeks to allow them to become well rooted, unless weed growth becomes too vigorous. If weeds become at all prevalent, the beds must be hoed without delay, for during this early stage of growth weeds and grass should never be allowed to grow or get ahead so as to cause the plants to receive a check, as plants that have their growth checked at this early stage rarely, if ever, recover.

Nothing but a push or scuffle hoe should be used in the cultivation of pineapples. A special hoe, 10 inches wide and about 3 inches deep and sharpened on both sides with a handle about 8 feet long has proved a very useful tool.*

The hoer should be a careful worker and should be instructed to stand in the trenches between the beds. He should never be allowed to walk among the plants or trample down the soil. The usual method of cultivation is to hoe from each side, pushing the hoe between the plant, gauging so that the hoe will cut about half an inch beneath the surface of the soil so as to cut off every weed or piece of grass showing. Great care should be taken not to disturb the plants by knocking the hoe against them, because when they are just beginning to take root the slightest jar will check their growth.

In about six weeks after the suckers have been planted, they should, under favourable conditions, be showing gowth. The best time to plant is probably during June, July and August. It is frequently a difficult matter to procure plants before July, for the reason that suckers and slips are hardly ripe enough for planting. If gathered immature they are liable to rot.

After the plants show growth, an application of tobacco dust will prove highly beneficial. This dust contains 6 to 8 per cent. of potash, 3 to 4 per cent. of ammonia, and about 2 per cent. of phosphoric acid. Besides being a good fertiliser, it is an insecticide, and this makes its use doubly valuable. The best method of applying tobacco dust is to have the labourer handle it in buckets. He carefully walks among the plants and drops a pinch of the dust into the heart or bud of each. This, of course, necessitates walking on the beds, but it can be done with care, and the beds can receive another hoeing afterwards. Dust is often applied before hoeing, so that the beds are left in a good condition.

Tobacco dust should be applied at intervals of two or three months in small doses, each application requiring about 600 lb. per acre if carefully distributed. Such applications can be continued until three months before flowering of the plants, when all applications should cease. As pine apples generally blossom or show fruit in January, no dust should be applied after October.

GATHERING THE FRUIT.

In twelve to fourteen months fruit should be in proper condition to pick, and if intended for foreign markets, should be gathered green but perfectly full. Experience can be the only guide in picking for shipment, so that a good colour may be obtained, for if pineapples are picked too green they would never assume a good rich colour. The method practised is for a picker to go into the fields followed by another man who should have a wicker basket of about one or more bushels to carry the fruit. This man takes each pine-apple from the picker and carefully places it in his basket. When the basket is filled, it is carried either to the packing house or placed in a spring cart or waggon padded with bagging to prevent the fruit from being bruised. It is thought that many growers in cutting the pineapple from the plant with about 2 inches or more of stalk attached to the fruit makes a mistake; for this stalk in a few days becomes sour and decays the fruit. The better method probably is to snap the fruit from the stalk. With a little practice this can be done without breaking the stalk, by gently pressing the knee upward under the pine-apple, and with the hand bend the fruit inwards until it snaps from the stalk. (A few slips removed from the side towards which the fruit is bent will cause the pine to snap from the stalk easier, but in no case remove all the slips during the early or latter growth of the pineapple, because they protect the fruit from the sun. Besides, the slips when allowed to grow the proper length are well worth planting and form a valuable asset to the planter.)

PACKING.

When the fruit is delivered at the packing house, it is carefully piled not more than three pines high, on tables or on a clean floor. It is left over night to cool off before being wrapped. The

* Such hoes may be obtained from Messrs. Parkes, Birmingham.

paper used for wrapping should be tough and strong, but not too thin or too thick. After the pines are sufficiently cooled, they should be carefully wrapped and placed where the packer will be able to get to them without moving from the crates. The crates hold twenty-four, thirty, thirty-six, forty, and forty-eight according to size, (forty-eight size being very small are seldom shipped). Each pine-apple is handled separately, and they are placed head and tail (or top and bottom) alternately in the crate. After the package is filled, the fruit should project about one inch above the sides of the crate, and the slats are then nailed. In this operation the slats should be gently pressed down with the knee and never nailed until each slat is firmly pressed down on the sides of the crate; otherwise, bruising of the fruit will result. Too much care cannot be taken in packing and handling all kinds of fruit.

Freight on all shipments must be prepaid, and proper bills of lading should be taken out; shipments for Canada must be accompanied by declaration made out in triplicate on regular forms, copies of which can be obtained either from agents in Canada or from the Imperial Department of Agriculture.

DISEASES.

The pine-apple plant is not affected with many diseases. Blight affects the Ripley and Queen family more than any other kind, and when established is very difficult to cure or to check. It sometimes spreads through fields with great rapidity, and within a short time healthy looking fields may present a withered and ruined appearance.

Black heart usually affects the Ripley and the Queen family, and can rarely be detected until the pine-apple is cut. Black spots are to be found in the fruit that utterly ruin it. The Ripley is extremely liable to this disease.

VARIETIES.

The *Abbakka* is probably the handsomest pine-apple grown, but its quality is very inferior. It is watery and flavourless, and a poor shipper.

Smooth Cayenne.—This is the St. Michael's pine-apple, and the only variety that sells in the London market for the highest prices. This variety cannot be grown with success in the West Indies. It has repeatedly been tried at Jamaica, but has eventually been abandoned.

The Smooth Cayenne will not endure the severe heat of the West Indies, and whilst some few good specimens have been grown, the cultivation has proved a failure. It is a watery pine-apple and is a poor shipper. Its fine appearance only recommends it. It is essentially a hot-house pine, and the expense and great care incidental to its culture in the Azores compels the grower to receive high prices for his fruit.

Sugar Loaf.—This variety is of fine quality, but is too tender to ship with safety. A few grown for local consumption and home use are, however, acceptable. There are other sorts that are misnamed 'Sugar Loaf' in Jamaica, and few persons really know a genuine pine of this variety, but when once shown, the difference between it and other misnamed varieties become apparent.

Black Pine or Black Jamaica.—This variety is so worthless that a description is hardly necessary. Suffice it to say that it is a coarse, ugly, watery, and insipid fruit that does not even deserve consideration, except to warn the inexperienced grower against planting it.

Antigua.—This pine-apple is well thought of in Antigua, but it is too small and possesses nothing to recommend it in any way for shipping purposes.

Sam Clark.—This fruit presents a pretty appearance, as it has a tremendous top, but it is only of inferior quality, being small, watery, and insipid.

Red Spanish (erroneously named in Jamaica, *Bull Head, Cow Boy, etc.*). This variety, although subject to slight variations, can be safely classed under one head, namely, Red Spanish. This pine-apple is the oldest variety and most extensively grown in the world; it forms the entire crop of Cuba, Florida, and the Bahama Islands, besides growing wild in many of the islands in the Caribbean Sea. It has proved the only profitable pine-apple to grow, and those contemplating taking up the growing of pine-apples will do well to bear this fact in mind. It is the only kind that sells for remunerative prices in the markets of the world. It is a splendid shipper, and, whilst not of finest quality, it possesses a good appearance, and is of a large size. Large crops of marketable fruit may be depended upon, for the plants are practically free from disease, and are vigorous and are very prolific in slips and suckers.

CONCLUSION.

The growing of pine-apples is a pleasant occupation, and if followed with care and proper attention, success is not uncertain, if adequate transportation or a local demand, such as canning factories, not too distant from the plantation, can

be depended upon. Growing pine-apples to be sold at ½d. per lb. delivered at the factory will pay the planter fairly well, and will allow the factory to earn a reasonable percentage on the investment.

Sixteen thousand pine-apple plants can be planted on one acre, and if the business is properly managed, the field should produce 80 per cent. fruit in from fourteen to sixteen months. Each pine-apple should average not less than 3 lb., and if the grower is so fortunate as to have a large local demand for his fruit, he will not be under the necessity of going to the expense of buying crates, wrapping paper, nails, and prepaying freight on his shipments. The business of consigning fruit is not as satisfactory as it should be, and the unfortunate planter is compelled to submit to many an injustice; but in Cuba and Florida, 75 per cent. of the pine-apples and oranges are sold for cash in the fields or in the groves at a contract price, the buyer taking all risk of shipment.—*Bulletin of the Department of Agriculture, Jamaica*, Vol. VI, Part 1, January, 1908.

PLANTAINS IN COSTA RICA.

Costa Rica is now the premier plantain or banana growing country of the world, a fact which will be news to many. The United Fruit Co. of Boston has 150,000 acres in plantains there. More than 400 steamer loads left Port Limon in 1906.
ED.

THE POISONOUS PROPERTIES OF THE BEANS OF *PHASEOLUS LUNATUS*.

(BONCHI OR CURRY BEAN.)

BY PROFESSOR WYNDHAM R. DUNSTAN, F.R.S., LL.D., AND T. A. HENRY, D.SC.

In 1901 the Imperial Institute received for investigation from the Director of the Station Agronomique, Mauritius, the beans of *Phaseolus lunatus*, a plant grown in that island for use as a green manure, the dark-coloured beans of which had proved to be poisonous. It was found on investigation that these beans were capable of yielding considerable quantities of prussic acid, the origin of which was traced to the presence of a glucoside, to which the name phaseolunatin was given, and a ferment, which was able to decompose the glucoside with the formation of prussic acid.

A full account of this glucoside is given in a paper communicated by us to the Royal Society (Proceedings of the Royal Soc., 1903, LXXII, 285). While this work was in progress, samples of beans known commercially as Paigya, Rangoon, or Burma beans, which were then being imported into this country in large quantities, were sent to the Imperial Institute for an opinion as to their suitability as feeding stuffs by various firms to whom consignments had been offered. Two varieties of these beans occur in commerce—the one pink, with small purple splotches, and distinguished as "red beans," the other pale cream in colour and known as "white beans." Numerous samples of the red beans were received, and each of these on examination was found to yield minute quantities of prussic acid. Only one sample of the white beans was received at this time, and from that no prussic acid could be obtained.

The red and white Rangoon beans, though as a rule lighter coloured, smaller and less shrivelled than the Mauritius beans, exhibited certain resemblances, which indicated that they also are derived from *Phaseolus lunatus*. Such marked differences in colour as were shown by the three varieties are well known to occur in species of this genus, and from information subsequently received from India there appears to be no doubt that these Rangoon, Burma or Paigya beans are produced by *Phaseolus lunatus*, the beans of which have long been known in India to be poisonous under some circumstances. Other vernacular names in use for these beans are "Lima" and "Duffin," the former being in common use in the United States.

In view of the fact that the white Rangoon beans examined at the Imperial Institute yielded no prussic acid, attempts were made to obtain the white beans of *Phaseolus lunatus* grown in other localities than India for comparison with them, and eventually "Haricots de Lima," grown in the South of France, were obtained through a firm of seedsmen in Paris. These were much larger than either the Mauritius or Indian beans and were cream white in colour. They were examined and found to furnish no pussic acid.

These observations that the red Rangoon beans yielded traces of prussic acid, and the white beans from two different sources none, confirmed the statements recorded by various authors that the white beans of *Phaseolus lunatus* are safer than the red kinds. Thus Professsor Church, in his "Food Grains of India" (p. 155), says:—"This is one of the

species of *Phaseolus* which sometimes exhibits marked poisonous properties. It is desirable that great care should be taken in selecting for cultivation the best variety of Lima beans. The large oval white seeded kinds, with at most a brown or black mark close to the hilum, are preferable to those with flattened reniform seeds having blotches of red or veinings of black."

On this point it is of interest to note that Cordemoy has stated ("Flore de l'île de la Réunion," 1895, p. 389) that in the wild state the beans of *Phaseolus lunatus* are purple and very poisonous; that on cultivation the colour of the seeds becomes modified to a yellowish tint with stripes or violet splotches, and that in this state the beans are rarely poisonous; and lastly that, after prolonged cultivation, large white beans are produced which are harmless. This statement, taken in conjunction with the facts recorded above, seemed to indicate that by cultivation of the plant the beans become white and then no longer produce the glucoside capable of yielding prussic acid.

After carefully reviewing the facts in consultation with the Director of the Imperial Institute, the Board of Agriculture came to the conclusion that it was desirable at this stage to warn consumers against the use of red and dark coloured beans of *Phaseolus lunatus*. (Journal, December, 1902, p. 373).

In 1905 interest in the matter of the production of prussic acid by the beans of *Phaseolus lunatus* was reawakened by the importation into the United Kingdom of large quantities of beans from Java, to the use of which, for feeding cattle, numerous cases of poisoning were traced, especially in Scotland.*

Samples of these "Java beans" were received at the Imperial Institute from various firms. They closely resembled the beans of *Phaseolus lunatus*, as received from Mauritius, and on examination proved, like these, to yield comparatively large quantities of prussic acid.

These "Java beans" were imported, not only into the United Kingdom, but also into Holland, Germany and France, and in all three countries similar poisoning cases occurred.

At this period a systematic investigation of the beans of *Phaseolus lunatus*, as produced in different localities, was undertaken by Professor Guignard ("Comptes Rendus," 1906, CXLVII, 545), and an examination of Java beans was made by M. Kohn-Abrest (ibid., p. 586).

*Journal, March, 1906, Vol. XII, p. 742, and April, 1906, Vol. XIII, p. 52.

Both these investigators confirmed the observations made at the Imperial Institute that the Java beans yielded comparatively large quantities of hydrocyanic acid. Professor Guignard also found that red Rangoon beans yielded small amounts of prussic acid, but he stated that the white cultivated beans of *Phaseolus lunatus*, such as those produced in Madagascar, Rangoon, Southern France, &c., also yielded prussic acid, though in most cases only in mere traces.

Messrs. Tatlock and Thomson examined a number of commercial samples of Java, Rangoon and haricot beans, and their results, which also indicate that some samples of the white beans of *Phaseolus lunatus* yield prussic acid, are given in the Analyst for August, 1906.

In March, 1907, Mr. Hendrick, chemist to the Highland and Agricultural Society of Scotland, sent to the Imperial Institute a sample of white Rangoon beans, which he had found on examination yielded ·016 per cent. of prussic acid.

In May, 1907, the Board of Agriculture called the attention of the Director of the Imperial Institute to the fact that white Rangoon beans had been found in some instances to yield prussic acid, and as it seemed desirable that the matter should be further investigated, a request was made to the Board of Agriculture for samples of Rangoon beans as sold throughout the United Kingdom for feeding purposes. A series of such samples, collected mainly in Scotland and the North of England by one of the Board's Inspectors, was received last July.

The Imperial Institute also obtained a number of samples of white Burma beans and other white beans of *Phaseolus lunatus* from firms in London and Paris, so that the inquiry could be made as general as possible.

The results of the examination of these samples are given in the following table:—

SAMPLES RECEIVED FROM THE BOARD OF AGRICULTURE.

	Prussic Acid. Per cent.
Red Rangoon beans, obtained at Leith	0·024
White Rangoon beans, obtained at Leith	Traces, too small to estimate
Hand-picked white Rangoon beans, obtained in Newcastle	0·020
White Rangoon beans, obtained in Newcastle ...	0·018

SAMPLES RECEIVED FROM LONDON DEALERS.

		Prussic Acid. Per cent.
Firm A.—	White Rangoon beans, ...	0·025
	White Rangoon beans, hand picked ...	0·027
Firm B.—	White Burma beans ...	0·026
Firm C.—	Tinned white Lima beans of American origin	none.

SAMPLES RECEIVED FROM SEEDSMEN IN PARIS, AND GUARANTEED TO BE PRODUCED BY *Phaseolus lunatus*.

	Prussic Acid.
Haricot de Lima, large cream	None.
" Sieva	Traces, too small to estimate.

These results indicate that, whilst there are varieties of the white beans of *Phaseolus lunatus* on the market which yield no prussic acid, some of the white Rangoon or Burma beans at present available in commerce yield this substance in quantities of some importance having regard to their use as a feeding stuff, whilst others, such as the white Rangoon beans obtained at Leith, yield mere traces.

It should be pointed out, however, that the quantities of prussic acid yielded both by red and white Rangoon beans are much smaller than those obtained from the Java and Mauritius beans. As a very large number of determinations of the amounts of prussic acid yielded by these various classes of beans have now been made, it may be useful to summarise the results in tabular form.

Origin and Colours of Beans.	Dunstan, Henry and Auld.	Guignard.	Kohn-Abrest.	Tatlock and Thomson.
	Prussic acid. Per cent.	Prussic acid. Per cent.	Prussic acid. Per cent.	Prussic acid. Per cent.
Java.				
Mixed beans of all colours ...	0·038—0·123	0·052—0·012	—	0·027—0·137
Black beans	0·107	0·046	—	0·042
Purplish-black beans ..	0·116	—	0·052	0·031
Wine-red beans	—	—	0·058	—
Reddish-brown beans ...	—	—	0·037	0·038
Bright maroon beans ...	—	—	0·050	—
Light brown beans with dark spots	0·103	—	0·041	0·038
Pale brown with dark spots	0·104	—	0·126	—
Cream white	0·105—0·110	0·052	0·037	0·027
Black with white stripes ...	0·062	—	0·058	—
Mauritius.				
Purplish-black	0·088	—	—	—
Brown	0·087	—	—	—
Light brown	0·041	—	—	—
Burma.				
Pale brown with purple spots	0·004—0·024	0·011	—	0·0009
Cream white	Nil—0·027	0·006	—	
France.				
"Haricots de Lima," large cream	Nil.	Traces.	—	—
"Haricots de Sieva," large cream	Traces.	0·004—0·008	—	—
"Haricots de Cap Marbre"	Traces.	—	—	—
Madagascar.				
White	—	0·008	—	—

In addition to the foregoing, a number of miscellaneous samples of beans have been received at the Imperial Institute for examination in connection with this inquiry, and as one of these, which is probably not the product of *Phaseolus lunatus*, also yields traces of prussic acid, it may be of interest to record the results here.

SAMPLES RECEIVED FROM THE BOARD OF AGRICULTURE.

	Prussic Acid.
"Large white haricots" obtained in Glasgow ...	Nil.
"Small white haricots," said to be of Hungarian origin	Nil.

SAMPLES OBTAINED FROM FIRMS IN LONDON.

		Prussic Acid.
Firm A.—	"Butter beans," large white ...	Traces
	"Dark red haricots"	Nil.
Firm B.—	Danubian beans	Nil.

SAMPLES OBTAINED IN PARIS.

	Prussic Acid.
Haricots d'Alger, blanc a rames	Nil.
Haricots d'Alger, noir a rames	Nil.

It is of interest to note that the "Butter beans" now largely sold for human food in this country furnish traces of prussic acid, but the other "haricot" beans included in this group, which are probably mainly, if not wholly, derived from *Phaseolus vulgaris*, yield none.

It will be seen on comparing the results quoted in these two sets of tables that all the earlier analyses indicate the production by white Burma beans of no prussic acid or only traces; fairly large quantities (0.016 to 0.026) per cent. have so far as is known only been recorded for consignments of white Burma beans imported during 1907. Even these quantities are, however, only about one-fifth of those yielded by some specimens of Java beans, which were coloured.

No explanation of this unfavourable change in the quality of white Burma beans can be given at present.

It has been suggested recently by the French Consul at Rangoon that consignments of Rangoon beans may contain small quantities of the poisonous beans of *Psophocarpus tetragonolobus*, and that their production of prussic acid may be due to such inclusions. The only extraneous beans noticed in samples, both of Rangoon and Java beans examined at the Imperial Institute, have been those of *Dolichos lablab*, which Dr. Leather has shown also yield small quantities of prussic acid. None of the investigators who have worked on Rangoon beans have recorded the occurrence among them of *Psophocarpus tetragonolobus* beans, so that there is no evidence to support the Consul's suggestion, whilst there is plenty of evidence that the Rangoon beans themselves actually yield prussic acid.

Although both red and white Burma beans have been imported in large quantities into the United Kingdom, and used for feeding cattle during the last few years, no cases of poisoning have so far been traced to them, but it is obvious that if the amount of prussic acid furnished by different consignments of these beans may vary over as wide a range as is shown by the figures quoted above, the use of these beans for feeding cattle may be attended with some danger.

There is nothing on record to show what ill-effects—if any—are produced by the long-continued use of feeding materials capable of producing small quantities of prussic acid, but the following facts are of some interest in this connection. It was shown by Jorissen and Hairs as long ago as 1888 that ground linseed when placed in contact with water yields prussic acid, and these authors found that this was due to the interaction of a glucoside and ferment. Recently, in conjunction with Dr. Auld, we have re-examined the glucoside and ferment of linseed and found that they are identical with the cyanogenetic glucoside and ferment of the beans of *Phaseolus lunatus*. (Proc. Roy. Soc., 1906, B. LXXVIII, 152). Since in the mere expression of oil from linseed the glucoside is not destroyed, it became of interest to ascertain how much of prussic acid is furnished by the linseed cake commonly used as a feeding stuff for cattle in this country. Samples of linseed cake were therefore obtained from two of the principal makers of this product in the United Kingdom. The samples of cake were both of the highest quality, and the linseed from which they were made was guaranteed by the firms to contain a minimum of 98 per cent of true linseed. The amount of prussic acid yielded by the two samples was estimated and found to be as follows:—

	Prussic Acid, Per cent.
Sample No. 1	0·035
,, No. 2	0·041

These quantities it will be seen are about 50 per cent. greater than those obtained from any of the samples of Burma beans examined. Although cases of the poisoning of cattle by green stems of linseed have been recorded in India, there are, so far as is known, no cases of poisoning of cattle by linseed cake on record in this country.

There is, however, one important difference between the "availablity" of prussic acid in the beans of *Phaseolus lunatus* and in the linseed cake of com-

merce. The former when ground and placed in water develop prussic acid immediately, but no prussic acid is formed when ground linseed cake is placed in water. This difference appears to be due to the fact that linseed cake is now made by hot expression of the oil, and the heat applied in this process is sufficient to destroy the activity of the ferment, to the effect of which on the glucoside contained in the linseed, the liberation of prussic acid is due. There is, however, always the possibility that the prussic acid-yielding glucoside may be decomposed by ferments present in other feeding stuffs used along with the linseed cake, even if it is not acted on by the intestinal ferments after ingestion.

In connection with this subject it may be of interest to mention what is known regarding the use of cassava in tropical countries. Two varieties of this plant, the bitter and the sweet, are known, and it was long supposed that only the roots of the bitter sort yielded prussic acid and were toxic. Recent investigations have, however, shown that at least in the West Indies both the sweet and bitter varieties yield similar amounts of prussic acid. Our investigations have shown that the origin of prussic acid in cassava is the same as in the beans of *Phaseolus lunatus* and linseed, viz., the interaction of phaseolunatin and a ferment. (Proc. Roy. Soc., 1906, B. LXXVII, 152). In preparing meal from cassava roots these are usually rasped into a coarse powder and the latter thoroughly washed. In this process the glucoside is brought into contact with the ferment and completely decomposed, the prussic acid formed being washed away by the water, so that it can be understood readily enough that meal so prepared is innocuous. Large quantities of cassava are also used as a vegetable, being boiled or baked in the same manner as potatoes. Treatment of this kind will destroy the activity of the ferment, but will not necessarily affect the glucoside, so that boiled or baked cassava is in much the same position as hot-pressed linseed cake, *i.e.*, it contains a glucoside, capable of yielding prussic acid, but is harmless so long as it is not in contact with a ferment capable of decomposing the glucoside.

Numerous cases of poisoning by cassava are on record, but these seemed to have been caused invariably by the consumption of raw cassava. It would seem, therefore, that in the cases of linseed and cassava, the application of enough heat to destroy the activity of the enzyme present renders these materials harmless, and the question arises as to whether similar treatment would not be efficacious in the case of Rangoon beans.

The statement has been made by exporters of Java beans that the latter become safe to use after being boiled in water, and Messrs. Tatlock and Thomson have stated *(loc. cit.)* that when Java beans are steeped in water and afterwards boiled, a considerable proportion of the prussic acid-yielding glucoside is removed. Experiments made at the Imperial Institute with Java beans have shown, however, that practically no change in the quantity of glucoside present is effected by this means, but as the activity of the enzyme is destroyed, the ground boiled beans no longer liberate prussic acid when mixed with water.

There is on record one case which seems to indicate that this treatment of Java beans is insufficient as a precaution against poisoning. Thus Robertson and Wynne state (Zeit. Anal. Chim., 1905, XLIV, 735) that four persons out of seven who had made a meal of cooked "Kratok" beans (Kratok is a vernacular name for Java beans in use in Holland and Germany), died, and in each case clear proof of poisoning by prussic acid was obtained.

In view of the large interests concerned in the trade in Rangoon beans, and as, apart from the prussic acid they yield, they appear to be a useful and nutritious feeding stuff, it seems desirable that the question of their suitability for use as a feeding material should be definitely settled. This is all the more important, as there is reason to believe that the white may come into use as a human food, since they closely resemble small haricot beans in appearance.

Until this question has been investigated it is undesirable that any further definite advice should be given to discontinue the use of Rangoon beans, since in spite of the fact that both the red and white varieties have now been shown to yield prussic acid, there is at present no evidence that this is formed in quantity sufficient to be injurious, and although these beans have been used as a feeding stuff now for some years, no poisoning cases have been traced to them so far as is known. At the same time, since the beans yield prussic acid in varying quantity, it is clearly not permissible to recommend them for use as a feeding material. All that can fairly be done at the moment is to place the facts on record.—*Journal of the Board of Agriculture*, March, 1908, Vol. XIV, No. 12.

THE AKEE TREE—*BLIGHIA SAPIDA.*

BY JNO. F. WABY.

This is a tree originally found in West Africa belonging to the natural order Sapindaceæ. It is also known under the nane Cupania, that of Blighia being given in the honour of Captain William Bligh, of H.M.S. "Bounty," who imported the plant, together with the Bread-fruit plant, from the island of Tahiti to the West Indies over a hundred years ago.

It grows to a height of some 30 feet with a spreading head, but till about 20 feet high is a handsome ornamental tree of a pyramidal form. It bears a fruit which is a valuable esculent and highly prized by Europeans in the West Indies.

It has been cultivated more in the island of Jamaica than elsewhere, and till a few years since only a few trees were growing in Demerara, some half-dozen being in the city of Georgetown. Latterly others have been grown in various parts of the colony, though to no great extent. In the Botanic Gardens it has never reached its fruiting stage, generally dying out in two or three years, but in the old Military Burial Ground at Eve Leary some planted in the year 1900 fruited in six years. One plant, a handsome young tree in the Promenade Gardens, has been fruiting regularly for several years. It has two seasons of fruiting, a light one in the spring about the month of March and a heavier one in the autumn about September or October.

The leaves are large, pinnate, in four and five pairs, and occasionally six pairs of leaflets. These are oblong in shape about 9 inches by 3 inches of an ordinary shining green above and pale dull green beneath; the veins are prominent, regular, about ⅜ inch between them. The flowers are small, borne on racemes 6 to 9 inches long, pendant from the axils of the leaves. The fruit is a succulent dehiscent capsule, a very pretty object, hanging like a crimson and yellow egg, 2½ to 3 inches long and 3 inches wide, three-sided. When ripe it opens in three valves, splitting down the middle of each side, disclosing three thick cream-coloured nut-like masses; at the base of each is embedded a shining black seed as large as a good sized marble. The case of the fruit is leathery about quarter inch thick. The cream-coloured masses, botanically known as "arils," are the parts used for food; they are formed of two lobes having a pink coloured integument between them which attaches them to the centre of the fruit.

The fruit must be picked fresh, *i.e.*, as soon as it splits open, because if allowed to hang long exposed to the air the arils become discoloured and stale, and are then unfit for food. Ants are very fond of the arils, so that when the fruit is picked it must be placed where these pests cannot get at it.

To prepare for use break open the fruit and detach the arils with the seeds, then break out the seeds. Split the arils in two and take out the pink-coloured integument; this is the portion which must be avoided as it is considered to be highly poisonous. In whatever way the akee is used it should be washed in salt and water to ensure its being perfectly clean. I cannot do better than give the late Mr. Jenman's receipts for the cooking of this delicious vegetable—for as a vegetable it is always used though it may be eaten raw —as he was a connoisseur in the matter and was the means of making the use of it largely known in the colony, gathering the fruit whenever he could get it, having it cooked in various ways and distributing it to whoever cared to try it. These are taken from his publications in "Garden, Field and Forest" in the year 1888:—

"First, I will describe the making of the well-known dish salt fish and akees. After careful cleaning and washing put the akees into boiling water in which a good pinch of salt has been thrown and boil slowly for ten or fifteen minutes, being careful not to boil too much. The use of boiling water is essential; if cold water be used the substance loses its firmness and becomes soft and watery before the boiling heat is reached. When they have boiled the required time, pour the water off and drain as dry as possible. In the meantime the saltfish has been boiled in the ordinary way; it has been shredded with a fork, and all the bones carefully removed. Then take both fish and akees, adding butter or lard according to taste and mix them together; in doing so being careful, for the sake of effect when the dish is placed on the table, not to break the akees too much, and serve hot.

"Akees may also be used for making fritters. For this purpose boil in the same way, drain dry, and beat them up with egg and seasoning. Fry and serve hot. The fritters may be modified by the addition of other substance in the making, such as fish or potato.

There is a famous dish called "Twice laid." This, too, is composed of saltfish and akees, but it is somewhat differently prepared from the fish of the latter name. Either shred the fish very fine, all bones having been removed, or pound it in a mortar. Then take an equal quantity of akees, which have been boiled and drained as before directed, and beat them up with egg, butter, or lard, making it into a thick paste. Add seasoning. Then take a pie-dish, and in it place alternate layers of the prepared fish and akees till the dish is full, the top layer being akees, and place in a quick oven to brown serving hot as usual. If akees are scarce a portion of boiled Irish potatoes may be employed, mashed and beaten up with them. If the fish and akees or other ingredients were mixed together first, instead of being placed in layers, much the same result would be realized.

"Lastly, akees may be boiled or fried and served as a side dish, and, cooked in the former way, with a little butter over them, an excellent dish they make too, though, personally, I regard this as the least desirable way to use them, it being rather a waste of good material for other dishes. Doubtless other ways, too, of preparing akees will occur to skilful or inventive cooks now that I have said so much."—*Journal of the Board of Agriculture of British Guiana*, Vol. I, January, 1908, No. 3.

NEW CACAO DRIER.

An illustrated description of a new apparatus for drying cacao by artificial heat, patented by Mr. H. Hamel Smith, appeared in the December number of Tropical Life, of which Mr. Smith is editor.

The principal feature of the drier is a large revolving wheel, on the circumference of which are a number of hollow cylinders in a horizontal position, and containing the beans to be dried. This wheel is enclosed in an outer case, and is fixed over a furnace, which supplies the necessary heat.

The provision of an aperture at the level of the furnace fire ensures the admittance of a current of air into the case containing the revolving wheel. This air is heated by passing around and over the furance, before being led into the wheel chamber. It finally passes off by an aperture at the top. The smoke from the fire is led off by a flue built up on one side of the drier, and this also affords additional heat. In working, the small cylinders would be about half filled with the cacao beans, and revolution of the large wheel, which is driven by hand power, ensures the constant turning of the beans. The apparatus costs about £150 for a small plant.—*Agricultural News*, Vol. VII, No. 152, Feb. 22, 1908.

CACAO INDUSTRY OF THE WEST INDIES.

Interesting papers in relation to the West Indian cacao industry were read at the late Agricultural Conference. The Hon. Francis Watts, C.M.G., summarised, on behalf of Mr. Joseph Jones and himself, the results of manurial experiments with cacao in Dominica, while Mr. R. D. Anstead and Mr. J. C. Moore viewed the progress of the experimental work carried on at Grenada and St. Lucia respectively. Mr. Joseph Jones also read a paper on trials in grafting cocao which have been made at the Dominica Botanic Station. A summary of Dr. Watts' remarks dealing with the Dominica experiments is given below, followed by a reprint of the paper presented by Mr. Anstead:—

CACAO EXPERIMENTS IN DOMINICA.

Manurial experiments are carried out in Dominica both at the Botanic Station and in the country districts. Those at the Botanic Station have been in progress since 1900, and now present results of considerable interest, clearly indicating the value of judicious manuring on the part of the cacao planter. There are five cacao experiment plots at the Station. Of these, one has been regularly manured each year with an application of 4 cwt. of basic phosphate and 1½ cwt. of sulphate of potash per acre, a second plot has been annually treated with 4 cwt. of dried blood per acre, and the third has received a complete manure (containing nitrogen, potash, and phosphates), composed of 4 cwt. of basic phosphate, 1½ cwt. of sulphate of potash, and 4 cwt. of dried blood per acre. The fourth plot has been annually mulched with grass and leaves, while the fifth has received no manure whatever.

Considering the crop returns obtained during the past five years, the results show that the use of phosphates and potash on the first plot has increased the yield of dry cured cacao by an average of 219 lbs. per acre per annum over the yield given by the unmanured plot. The use of the dried blood alone, primarily a nitrogenous manure, increased the return of cacao by 187 lb., while the combination of the two sets of

manures, *i. e.*, phosphates, potash and dried blood resulted in an average yield of 374 lb. per acre per annum over and above that obtained from the unmanured plot. The mulching gave the greatest gain of all, viz., 402 lb. in excess of the return from the unmanured plot. Dr. Watt mentioned also that the cacao trees on the mulched plot are much finer and better developed than those in the other plots, and also that the soil of the mulched area is in exceptionally good physical condition. Although such good results have been obtained with mulching alone, Dr. Watts pointed out that in many cases it will be well to supplement mulching with moderate applications of nitrogen and phosphate. It is believed that potash is not urgently needed as a fertilizing constituent in Dominica, as the soils of the island are fairly well supplied.

The results obtained with the experiment plots in the country districts show that manures are beneficial and remunerative in the establishment of young cacao, and that pen manure, when obtainable, is likely to give the best results.

Observation shows that good general results are likely to follow the intelligent use of the weeds growing in a cacao orchard. When the country experiment plots were first laid out in Dominica, attempts were made to keep weeds down thoroughly by a system of clean weeding. The soil showed signs of deterioration, but on altering the method of treatment, allowing the weeds to grow to a moderate height, and then either cutlassing them down. or bedding them in with the fork, surprisingly good results followed.

Mr. R. D. Anstead then read the following paper, reviewing the experimental work with cacao that is in progress at Grenada, of which island Mr. Anstead is Agricultural Superintendent.

In Grenada, experiment plots of cacao are of two kinds, distinguished for the sake of reference, by the term 'experiment plots' and 'experiment stations.'

The experiment plots, as was explained at the last Agricultural Conference (West Indian Bulletin, Vol. VI, p. 66), are each about one acre in extent, and are chosen from land near the public roads, belonging to peasant proprietors.

The experiments carried out upon these plots are conducted by the Imperial Department, and are designed to run for three years, the cost of them being defrayed from Imperial funds.

The results obtained by means of these plots are highly satisfactory. The Agricultural Instructor uses them as a rendezvous when he is in the district, and as demonstration plots. Here he is able to meet the peasants, and to show them how agricultural operations, such as forking, drainage and pruning should be carried out, and how manures should be applied.

Considerable interest has been taken in the plots by the neighbouring peasants, and the operations carried out upon them are imitated to an encouraging extent. The plots were originally chosen in poor areas, and where trees have been considerably neglected, in order that the benefits of scientific treatment may be the more marked. A good crop serves as an excellent object-lesson to all cultivators of cacao, and indicates how the most satisfactory results are to be obtained. This year, for instance, from a plot one acre in extent, the owner has picked two-thirds of the total yield of cacao usually derived from five acres of land.

With regard to the actual results of the experiments, figures are kept as accurately as possible, and published from year to year in the Annual Report of the Botanic Station; but from a purely experimental point of view, and as a means of obtaining accurate numerical results, the second class of experiments—the 'experiment stations'—should afford better opportunities than the experiment plots, since they are on a bigger scale and are run more on estate lines.

These experiment stations are established on large estates and consist of not less than five acres or 1,000 trees. The cost of the experiments is borne by the owners, the Imperial Department supplying scientific advice as to the experiments, and the manner in which they should be conducted. These stations, of which there are at present five, have become very popular, and next year a number of others will be started.

The result of establishing them has been to make the larger proprietors take a lively interest in scientific experiments carried out on their own estates—experiments designed to answer questions and solve problems connected with their own soils and conditions.

It is as yet too early in the history of these experiments to be able to give, with any confidence, numerical results, but two facts are already apparent: firstly, that cacao grown on the heavy red clay soils of Grenada responds quickly and liberally to the applications of lime; and secondly, that pen manure, when applied in heavy dressings and thor

oughly and deeply forked in, is of considerable value, and gives results that compare very favourably with mineral and chemical fertilizers.

Mr. Jones' paper on the grafting of cacao, and the paper read by Mr. Moore on experimental work at St. Lucia, will be reprinted in the next number of the Agricultural News.—*Agricultural News*, Vol. VII, No. 152, February 22, 1908.

THE COCONUT WITH REFERENCE TO ITS PRODUCTS AND CULTIVATION IN THE PHILIPPINES.

MANURING.*

The manuring problem must be met and solved by the best resources at our command. The writer has had pointed out hundred of trees that, wholly guiltless of any direct application of manure, have borne excellent crops for many successive years; but he has also seen hundreds of others in their very prime, at thirty years, which once produced a hundred select nuts per year, now producing fluctuating and uncertain crops of fifteen to thirty inferior fruits.

Time and again native growers have told me of the large and uniformly continuous crops of nuts from the trees immediately overshadowing their dwellings and, although some have attributed this to a sentimental appreciation and gratitude on the part of the palm at being made one of the family of the owner, a few were sensible enough to realize that it came of the opportunity that those particular trees had to get the manurial benefit of the household sewage and waste.

Yet, the lesson is still unlearned and, after much diligent inquiry, I have yet to find a nut grower in the Philippines who at any time (except at planting) makes direct and systematic application of manure to his trees.

In India, Ceylon, the Penang Peninsula, and Cochin China, where the tree has been cultivated for generations, the most that was ever attempted until very recently was to throw a little manure in the hole where the tree was planted, and for all future time to depend on the inferior, grass-made droppings of a few cattle tethered among the trees, to compensate for the half million or more nuts that a hectare of fairly productive trees should yield during their normal bearing life.

* Throughout this paper the writer uses this word in preference to "fertilizing" even when speaking of so-called "commercial fertilizers."

Upon suitable coconut soils—*i.e.*, those that are light and permeable—common salt is positively injurious. In support of this contention, I will state that salt in solution will break up and freely combine with lime, making equally soluble chloride of lime which, of course, freely leach out in such a soil and carry down to unavailable depths these salts, invaluable as necessary bases to render assimilable most plant foods; and that, on this account, commercial manures containing large amounts of salt are always to be used with much discretion, owing to the danger of impoverishing the supply of necessary lime in the soil.

Finally, so injurious is the direct application of salt to the roots of most plants that the invariable custom of trained planters (who, for the sake of the potash contained, are compelled to use crude Stassfurt mineral manures, which contain large quantities of common salt) is to apply it a very considerable time before the crop is planted, in order that this deleterious agent should be well leached and washed away from the immediate field of root activity.

That the coconut is able to take up large quantities of salt may not be disputed. That the character of its root is such as to enable it to do so without the injury that would occur to most cultivated plants I have previously shown, while the history of the coconut's inland career, and the records of agricultural chemistry, both conclusively point to the fact that its presence is an incident that in no way contributes to the health, vigor, or fruitfulness of the tree.

Mr. Cochran's analysis, based upon the unit of 1,000 average nuts, weighing in the aggregate 3,125 pounds, discloses a drain upon soil fertility for that number, amounting in round numbers to—

	Pounds.
Nitrogen	$8\frac{1}{4}$
Potash	17
Phosphoric acid	3

Reducing this to crop and area, and taking sixty fruits per annum per tree as a fair mean for the bearing groves in our coconut districts and on those rare estates where a systematic spacing of about 173 trees to the hectare has been made, we should have an annual harvest of 10,300 nuts, or, stated in round numbers, 10,000, which will exhaust each year from the soil a total of—

	Pounds.
Nitrogen	$82\frac{1}{2}$
Potash	170
Phosphoric acid... ..	30

The coconut, therefore, while a good feeder, may not be classed with the most depleting of field crops.

To make this clear I exhibit, by way of contrast, the drafts made by a *relatively* good crop of two notoriously soil-impoverishing crops—tobacco and corn—and, on the other hand, the drafts made by an equivalent average cotton crop, a product considered to make but light drains upon sources of soil fertility.

A proportionate tobacco crop of 1,000 kilos per hectare will withdraw from the soil (reduced to the same standard of weights adopted by Mr. Cochran)—

	Pounds.
Nitrogen	168
Potash	213
Phosphoric acid... ...	23

An equivalent crop of shelled corn, say, of 125 bushels per hectare, will withdraw—

	Pounds.
Nitrogen	200
Potash	135
Phosphoric acid ...	75

while a relative crop of lint cotton of 237 kilos (700 pounds) per hectare* will only exhaust, in round numbers—

	Pounds.
Nitrogen	114
Potash	70
Phosphoric acid ..	30

There is an analogy between these four products that make them all comparable, in so far as all are largely surface feeders, and, as experience shows that there can be no continuing success with the last three that does not include both cultivation and manuring, we may use the analogy to infer a like indispensable necessity for the successful issue of the first.

Cultivation as a manurial factor should, therefore, not be overlooked, and all the more strongly does it become emphasized by the very difficulties that for some zyears to come must beset the Philippine planter in the way of procuring direct manures.

When it comes to the specific application of manures and how to make the most of our resources, we shall have to turn back to the analysis of the nut and note that, relatively to other crops, it makes small demands for nitrogen. At the same time it must not be forgotten that these chemical determinations only refer to the fruit, and that, with the present incomplete data and lack of investigation of the constituent parts of root, stem, leaf, and branch, we have nothing to guide us, but what we may infer from the behaviour of the plant and relationship to plants of long-deferred fruition, whose manurial wants are well understood.

It is now the most approved orchard practice to encourage an early development of leaf and branch by the liberal application of nitrogen, whose stimulant actions upon growth are conceded as the best.

In temperate regions, the exigencies of climate exact that this be done with discretion and care, in order that the unduly stimulated growths may be fully ripened and matured against the approach of an inclement season. In the Tropics no such limitations exist, and the early growth of the tree may be profitably stimulated to the highest pitch. That this general treatment, as applied to young fruit trees, is specially the one indicated in the early life of the coconut, may be quickly learned by him who will observe the avidity with which the fleshy roots of a young coconut will invade, embrace, and disintegrate a piece of stable manure.

Notwithstanding lack of chemical analysis, we may not question the fact that considerable supplies of both potash and phosphoric acid are withdrawn in the building up of leaf and stem; but these are found in sufficient quantity in soils of average quality to meet the early requirements of the plant. It is only when the fruiting age is reached that demands are made, especially upon the potash, which the planter is called upon to make good.

Good cultivation, the application of a generous supply of stimulating nitrogen during its early career, and the gradual substitution in later life of manures in which potash and phosphoric acid, particularly the former, predominate, are necessary.

How, then, may we best apply the nitrogen requirements of its early life? Undoubtedly through the application of abundant supplies of stable manures, press cakes, tankage, or of such fertilizers as furnish nitrogen in combination with the large volume of humus necessary to minister to the gross appetite of the plant under consideration. But the chances are that none of these are available, and the planter must have recourse to some of the green, nitrogen-gathering manures that are always at his command.

He must sow and plow under crops of peas, beans, or other legumes that will furnish both humus and nitrogen in

*Farmers' Bulletin, 114, United States Department of Agriculture.

excess of what they remove. Incidentally, they will draw heavily upon the potash deposits of the soil, and they must all be turned back, or, if fed, every kilo of the resulting manure must be scrupulously returned. He must pay for the cultivation of the land, for the growing of crops that he turns back as manure (and that involves further expense for their growing and plowing under), and, in addition, he must be subject to such outlay for about seven years before he can begin to realize for the time and labour expended.

But there are expedients to which the planter may have recourse which, if utilized, may return every dollar of cultural outlay. By the use of a wise rotation he can not only maintain his land in a good productive condition, but realise a good biennial crop that will keep the plantation from being a financial drag. The rotation that occurs to me as most promising on the average coconut lands of these Islands would be, first, a green manure crop, followed by corn and legumes, succeeded by cotton, and then back to green manures.

To make the first green crop effective as manure, both lime and potash are essential—the former to make available the nitrogen we hope to gather, and the potash in order to secure the largest and quickest growth of the pulse we are to raise for manurial purposes.

Both these elements are generally in good supply in our coconut lands; but, if there is uncertainty upon this point, both should be supplied in some form. Fortunately, the former is cheap and abundant in most parts of the Archipelago, and, when well slaked, may be freely applied with benefit at the rate of a ton or even more to the hectare.

In default of the mineral potash salts, the grower must seek unleached wood ashes, either by burning his own unused jungle land to procure them, or by purchasing them from the neighbour who has such land to burn over. If located on the littoral, he will carefully collect all the seaweed that is blown in, although in our tropical waters the huge and abundant marine algæ are mostly lacking. Such as are found, however, furnish a not inconsiderable amount of potash, and, in the extremities to which planters remote from commercial centres are driven, no source is too inconsiderable to be overlooked.

The first green crop selected will be one known to be of tropical origin, which, with fair soil conditions, will not fail to give a good yield. He may with safety try any of the native rank-growing beans, cowpeas, soja, or velvet beans; or, if these are not procurable, he has at command everywhere an unstinted seed supply of *Cajanus indicus*, or of *Clitorea ternatea*, which will as well effect the desired end—to wit, a great volume of humus and a new soil supply of nitrogen. It remains for the planter to determine if the crop thus grown is to be plowed under, or if he will use it to still better advantage by partially feeding it, subject, as previously stated, to an honest return to the land of all the manure resulting therefrom.

He may utilize it in any way, even to selling the resulting seed crop, provided all the remaining brush is turned back to the land and a portion of the money he receives for the seed be reinvested in high-grade potash and phosphatic manures. The plantation should now be in fair condition for a corn corp, and, as a very slight shading is not prejudicial to the young palms, the corn can be planted close enough to the trees, leaving only sufficient space to admit of the free cultivation that both require.

It must not be forgotten that corn makes the most serious inroads upon our soil fertility of any of the crops in our rotation, and, unless by this time the planter is prepared to feed all the grain produced to fatten swine or cattle, it had better be eliminated from the rotation and peanuts substituted. In addition to this, he must still make good whatever drains the corn will have made upon this element of soil fertility.

Cropping to corn attacks the coconut at a new and vulnerable point, against which the careful grower must make provision. It will be remembered that an average corn crop makes very considerable drafts upon the soil supply of phosphoric acid; but, if the grain is used for fattening swine, whose manure is much richer in phosphates than most farm manures, and the latter is restored to the land, serious soil impoverishment may be averted.

The next step in our suggested rotation is the cotton crop. Here, too, limitations are imposed upon the planter who is without abundant manurial resources to maintain the future integrity of his grove. He may sell the lint from his cotton, but he cannot dispose of it (as is frequently done here) in the seed.

If the enterprise be not upon a scale that will justify the equipment of a mill and the manufacture of the oil, he has no alternative but to return the seed in lieu of the seed cake, wasteful and extravagent though such a process be.

The oil so returned is without manurial value, and, if left in the seed, is so much money wasted. The rational process, of course, calls for the return of the press cake, either direct or in the form of manure after it has been fed. With this is also secured the hull, rich in both the potash and the phosphoric acid,* which we now know is so essential to the future welfare of the grove.

The above rotation is simply suggested as a tentative expedient.

The ground will now be so shaded that we cannot hope to raise more catch crops for harvesting, although it may be possible during the dry season to raise a partial stand of pulses, of manure value only; but, from the fruiting stage on, this becomes a minor consideration.

This stage of the cultural story brings us once more face to face with the principle contended for at the beginning of this paper, namely, that there can be no permanent prosperity in this branch of horticulture until the crop is so worked up into its ultimate products, that none of the residue of manufacture goes to waste.

At best the return of these side products is insufficient, and, despite their careful husbandry, we cannot ultimately evade a greater or less resort to inorganic manures of high cost and different procurement.

The residue from the press cake is rich in nitrogen and humus, which, in the ever-increasing shade of the grove, will become more and more difficult to produce there through nitrogen-making agencies; but the waste from the manufacture of coir and the ashes from the woody shell will go far toward supplying the needed potash.

Such a system would, if closely followed, practically restrict the farmer's ultimate purchases to a small quantity of acid phosphates, or of bone dust, which, in conjunction with good tillage, should serve to maintain the grove in a highly productive condition for an indefinite term of years.

As an auxiliary manurial agent of definite, well-proven value in this Archipelago, I will briefly recite some of the benefits that may be expected to follow occasional irrigation during the dry season.

It strongly accelerates growth and early maturity. A few irrigated trees, reputed to be under five years from seed and already bearing fruit, were shown the writer on the Island of Joló. The growth was remarkably strong and vigorous, notwithstanding that the water of irrgation had been applied in such a way that the tree could only hope to derive a minimum of benefit from its application. It had merely been turned on from a convenient ditch whenever the soil seemed baked and dry, at intervals of one to three weeks, as circumstances seemed.

Irrigation, but always in connection with subsequent cultivation, may be considered equal to a crop guaranty that is not afforded so effectually by any purely cultural system.

Rarely has a better opportunity occurred to demonstrate the unquestioned benefits that have inured to these few Joló trees from the use of irrgating waters than the present season of 1902-03. From many sources reports come to this Bureau of trees failing, or dying outright, from lack of moisture. While it is true that the present dry season has had no parallel since 1885-86, and that the rainfall during the dry season has been less than half the normal, yet it should not be forgotten that, during the eight months from October to May, inclusive, the average precipitation on the west coast, at the latitude of Manila, is only about 460 mm., and that, when the amount falls below this, the coconut is bound to suffer.

Though it is true that the evil effects of drought may be modified, if not altogether controlled, by cultivation, the assistance of irrigation places the cultivator in an impregnable position. If evidence in support of this statement were called for, it might be found today in the deplorable condition of those groves that have been permitted to run to pasture, as compared with those in which some attempts have been made to bolo out the encroaching weeds and grasses.

It is probably true that, except on very sandy soils, continued surface irrigation would aggravate the superficial root-developing tendency of the tree; and to what extent, if any, occasional laceration by deep shovel tooth cultivation would injure the tree remains to be seen. There are, however, few economic plants that so quickly repair root damage as the Palmae, and, unless the seat of injury extends over a very large area, it is probable that the resulting injury would be of no consequence, as compared with the general benefits that would result from irrigation.

* Com. Exp, Sta. Rep., Part II.

HARVEST.

Harvest of the crop requires but a brief discussion. The nuts should be plucked when ripe. The phenomenon of maturity cannot be readily described in print. It frequently is as evident in nuts of a bright green color as in those of a golden-yellow color, and the recognition is one of those things that can only be learned by experience.

The practice, so general in the Seychelles, of allowing the nut to hang till it falls to the ground is certainly undesirable in these islands. On the contrary, the overripe nuts will seldom fall until dislodged by a storm, and it is no uncommon thing to see nuts that have sprouted and started to grow upon trees in plantations where the harvest is left to the action of natural causes. Such nuts, of course, are entirely worthless for the manufacture of oil or copra, and even the husk has depreciated in value, the finest coirs, in fact, being derived only from the fruit that have not attained full ripeness. In any case, the nuts should be picked and the crop worked up before any considerable enlargement or swelling of the embryo occurs. From this time onward physiological changes arise which injuriously affect the quantity and quality of what is called the meat.

The heaping up of the nuts for some time after harvest favors some milk absorption, which seems to facilitate the subsequent easy extraction of the endosperm.

ENEMIES.

Outside of certain insects of the order Coleoptera, coconuts in the Philippines are reasonably free from enemies; in some districts, close to forest-clad areas, the raids of monkeys do some damage. A tree-nesting rat, which nibbles the young nuts, is also a source of considerable loss. The rat is best overcome by frequent disturbance of his quarters. This involves the removal of the dead leaves and thatch that form constantly about the base of the crown. But the wisdom of this recommendation will depend entirely upon circumstances. As the planter may find that rats or the rhinoceros beetle are the lesser evil, so should he be governed.

There are localities in the Archipelago where the plague of rats is unknown and where the beetles abound. In that case it would be unwise to disturb the leaves which are very tardily deciduous and do not naturally fall till the wood beneath is hard, mature, and practically impervious to the attacks of insects.

Where rats are numerous and insects few, which is the case in some localities, the dead and dying leaves, among which the rat nests, may be advantageously cleared away whenever the tree is climbed to harvest the fruit.

Among serious insect enemies we have to contend largely with the very obnoxious black beetle, *Oryctes rhinocerus*, and, fortunately, to a lesser extent, with *Rhynchoporus ferrugineous* (probably the same as *R. ochreatus* of Eydoux), while *R. pascha*, Boehm., and *Chalcosma atlas*, Linn., are also said to appear occasionally.

However different their mode of attack, the general result is the same, and their presence may surely be detected by the appearance of deformed or badly misshapen or lacerated leaves.

The attacks of all species are confined to the growing point and as far downward as the wood is tender and susceptible to the action of their powerful mandibles.

The black beetle makes its attacks when fully mature, eating its way into the soft tissues and generally selecting the axil of a young leaf as the point of least resistance. Others simply deposit their eggs, which hatch out, and the resulting grub is provided with jaws powerful enough to do the same mischief. Two or three of these grubs, if undisturbed, are sufficient in time to completely riddle the growing tip, which then falls over and the tree necessarily dies.

REMEDIES.

Remedies may be described as preventive and agressive, and, by an active campaign of precaution, many subsequent remedial applications can be avoided.

Most of the beetles attacking the palm are known to select heaps of decomposing rubbish and manure as their favourite (if not necessary) breeding places, and it is obviously of importance to break up and destroy such; nor can any better or more advantageous way of effecting this be suggested than by promptly spreading and ploughing under all such accumulations as fast as they are made; or, if this be impracticable, by forking or turning over or otherwise disturbing the heaps, until convenient to dispose of them as first suggested.

A truly preventive and simple remedy, and one that I can commend as a result of close observation, is the application of a handful or two of sharp, coarse, clean sand in the axillæ of the young leaves. The native practice is to mix this with

ashes, salt, or tobacco dust; but it is questionable if the efficacy of the remedy lies so much in these additions as in the purely mechanical effect of the sand, the constant addition of which cannot be other than highly objectionable to the insect while burrowing.

Of offensive remedies, probing with a stout hooked wire is the only form of warfare carried on in these Islands; but, as the channel of the borer is sometimes tortuous and deep, this is not always effective. A certain, simple, and easily applied remedy may be found in carbon bisulphid. It could be applied in the holes (which invariably trend downward) with a small metal syringe. The hole should be sealed immediately with a pinch of stiff moist clay.

It is likely that this remedy and probing with a wire are the only successful ways of combatting the red beetle, whose grub strikes in wherever it finds a soft spot; but, for these species which attack the axils of the leaves, I have great faith in the efficacy of the "sand cure," and no nut picker should go aloft unprovided with a small bamboo tube of dry, sifted sand, to protect the bases of recently expanded leaves.

In Selangor coconut trees now come under the Government inspection, and planters and owners, under penalties, are compelled to destroy these pests. Mr. L. C. Brown, of Kuala Lampur, in that State, who writes intelligently on this subject,* lays great stress on the value of clean cultivation in subduing beetles, and repeats a cultural axiom that never grows old, and that will, consequently, bear reiteration here—that it is rarely anything but the neglected plantation that suffers, and that the maintenance at all times of a healthy vigorous growth is in itself almost a guaranty of immunity from attacks of these pernicious insects.

While we, unfortunately, know that this is not in all cases an assured protection against diseases or insect enemies, it certainly minimizes the danger and, in itself, is a justification of the high-pressure cultural treatment advocated throughout the preceding pages.

RENOVATION OF OLD GROVES.

Material improvement of old plantations may sometimes be effected and, unless the trees are known to be upward of fifty years old, generally repays the labour. Marked increase in crop has followed a heavy thinning out of trees upon the Government coconut farm at San Ramon, Mindanao. The improvement that a free cultivation of air and abundant sunlight have effected is very marked. Where it can be done, ploughing is also sometimes feasible and should be followed by immediate crop improvement. The average native plough is not so well adapted for working over an old or neglected grove as it is for original soil preparation. It acts more as a subsoiler and will tear and lacerate more roots than is desirable. A single carabao, or one-horse American garden plough is the better implement for this work. Extensive bat guano deposits are found in Mindoro, Guimaras, and Luzon. Some of them show richness in nitrogen and, when accessible at a moderate cost, would be useful in the renovation of old groves, where the shade would be adverse to the rearing of good crops of nitrogen gatherers.

* Ag. Bull. Fed. Malay States, February, 1903.

CONCLUSION.

1. There are large areas throughout the littoral valleys of the Archipelago, as yet unexploited, which, in the essentials of soil, climate, irrigation facilities, and general environment, are suitable for coconut growing.

2. The present conditions present especially flattering attractions to coconut growers capable of undertaking the cultivation upon a scale of some magnitude. By co-operation, small estates could combine in the common ownership of machinery, whereby the products of the grove could be converted into more profitable substances than copra.

3. The present production of copra (estimated at 278,000 piculs in 1902) is an assurance of a sufficient supply to warrant the erection of a high-class modern plant for the manufacture of the ultimate (the "butter") products of the nut. The products of such an enterprise would be increased by the certainty of a local market in the Philippines for some part of the output. The average market value of the best grades of copra in the Marseilles market is $54·40, gold, per English ton. The jobbing values on January 1 of this year, of the refined products, were, for each ton of copra:—

Butter fats	$90·00
Residual soap oils ...	21·00
Press cake	5·20
Total...	116·20

The difference representing the profit per ton, less the cost of manufacture.

4. The minimum size of a plantation, on which economical application of oil and fibre preparing machinery could be made, is 60 hectares.

5. There is no other horticultural tropical product which may be grown in these Islands where crop assurance may be so nearly guaranteed, or natural conditions so nearly controlled by the planter who, knowing correct principles, has the facilities for applying them.

6. The natural enemies and diseases of the plant are relatively few, easily held in check by vigilance and the exercise of competent business management.

7. The labor situation is bound more seriously to affect the small planter, wholly dependent upon hand labor, than the estate conducted on a large enough scale to justify the employment of modern machinery.

8. In view of an ever-expanding demand for coconut products, and in the light of foregoing conclusions, the industry, when prosecuted upon a considerable scale and subject to the requirements previously set forth, promises for many years to be one of the most profitable and desirable enterprises which command the attention of the Filipino planter.

The greatest mine of horticultural wealth which is open to the shrewd planter lies in the heaps of waste and neglected husks that he can now procure from adjoining estates for the asking and cartage.

With labour at 1 peso per diem and at the present price of potash and phosphoric acid, all the husks in excess of 300 per diem which could be hauled would be clear profit. The ashes of these, when burned and applied to the old grove, would have an immediate and revivifying influence.

Many trees in an old plantation have ceased to bear. Whether this is due to exhaustion from old age or from soil exhaustion is immaterial; each should be eradicated and the time-honored custom of replanting a fresh tree in its place abandoned. These renewals are difficult enough in any fruit or nut orchard where the scientific cultural conditions have been of the best. Renewals in a coconut grove, unless the vacant space is abnormally large and can be subjected to some years of soil improvement are unprofitable.

There is a wide range of opinion as to the bearing life of a coconut tree. It is said to vary from thirty to one hundred and thirty years. Grown more than forty, or possibly fifty years old, the writer would hesitate to undertake the improvement or renewal of the grove.

Palms, unlike exogenus trees, afford no evidence by which their age may be determined. In general, with advanced years, come great height and great attenuation. In the open, and where fully exposed to atmospheric influences, these form an approximate criterion of age. The so-called annular scars, marking the earlier attachments of leaves, furnish no clue to age.—*Department of the Interior, Philippines Bureau of Agriculture, Farmers' Bulletin* No. 8.

COCONUT SPLITTING FOR COPRA.

By J. C. Willis,

In the Hawaiian Islands the natives, instead of first taking off the coir and then splitting the nut, split the whole nut with one blow of a heavy knife and then stand it out in the sun to dry the copra. If sun drying is used, so that space is not a consideration, there seems a good deal to be said for this method.

THE COCONUT IN SAMOA.

(Exploitation du Cocotier à Samoa. d'apres Preuss. Journ. d'Agr. trop. Mar. 1908, abstracted by J. C. Willis.)

The European plantations, mostly belonging to the Deutsche Handels und Platagen Gesellschaft, covered 3,550 hectares in 1906, and had 325,000 palms, while the natives probably had at least 700,000 palms. About 9,000 tons of copra are annually exported.

The cultivation of the coconut is much less intensive than in Ceylon, where labour is more easily obtainable. A circle of about 10 feet in diameter is kept clean round each palm, but a circle of 2 feet in diameter is left untouched to prevent destruction of roots by the winds. The palms are planted in general 32×32 feet, though on some plantations 28×28. In young plantations manioca, castor-oil, sweet potatoes, chillies &c., are grown as catch crops. In older plantations the land is given up to pasturage. The Deutsche Handels und Plantagen company has 2,500 head of cattle on 3,000 hectares (1 for 3 acres). Illuk grass is very troublesome, and to check it *Passiflora fœtida* is sown between the trees.

PIMENTO GROWING IN JAMAICA.

An interesting account of the methods followed in the growing and preparation of pimento (*Pimenta officinalis*), is contributed by the American Consul at Kingstor, to the United States *Consular and Trade Reports* for the month of November.

The particulars given below have been abstracted from the article in question, with a view of supplementing the information on pimento growing which has already appeared in the *Agricultural News* (Vol. IV, p. 295).

Jamaica appears to be the only country in the world from which pimento is exported; although an inferior quality of the spice is grown in Mexico, and other parts of Central and South America.

The pimento berries are dark in colour, and about as large as a pea. They possess an odour and flavour resembling a mixture of cinnamon, cloves, and nutmegs, from which the name 'allspice' has been given to them. The pimento tree, which belongs to the myrtle family, attains a height of 30 feet.

The tree flourishes in the wild state, and plantations are readily established by allowing land near pimento trees to become overgrown with bush from which young seedling spring up, as a result of a large number of seeds deposited by the birds that have been eating the pimento berries. The bush is then cleared, and the pimento trees are allowed to grow up. Most of the plantations in Jamaica were formed in this way. It is stated that the best results are obtained, when a distance of 20 feet is allowed from tree to tree. The tree grow well on a poor soil, when it is fairly light and well drained.

The first crop is yielded when the trees are about seven years old, and after that the crops increase each year until the trees reach maturity, which takes place at about eighteen or twenty years old. The berries, which form the 'allspice' of commerce, grow in clusters on the tree. They are gathered while green, before arriving at the stage of ripeness. The full, but unripe berry is spicy and indeed somewhat peppery. In gathering the berries the process followed is for one person to climb the tree and break off the young branches, which are thrown to the ground, the berries being picked from the stalks by women and children. Ripe berries are kept separate from the green ones. Contrary to what might be expected, this breaking of the branches does not seem to damage the trees, but it is stated to afford the necessary annual pruning without which the trees would not bear regularly.

The berries are afterwards put through a drying process, in the same manner as coffee, the process lasting from three to twelve days. This takes place either in the sun or sometimes in wet weather by means of an American fruit evaporator. The fruits are known to be sufficiently dry when the seeds rattle on shaking, and are of a dark, spicy colour. In favourable seasons, as much as one hundredweight of dry spice is obtained from a single tree.

When ripe, the pimento berries are of a glossy black colour, sweet and spicy in flavour. If not picked before reaching this stage, such berries are often used to make pimento dram, a native drink. From the leaves of the pimento an essential oil is distilled, which, added to rum, makes bay-rum. The annual average export of pimento from Jamaica is about 75,000 bags, weighing, on an average, 145 lb. each.

In 1905-6, the Jamaica pimento crop fell short of the average, on account of the heavy and destructive rains which occurred at the time when the berries were forming on the trees, and the 1906-7 crop was again short as a result of the prolonged drought. On account of the continuance of the drought, this year's crop is again expected to be small, and will probably not exceed 40,000 cwt.

As a result, the price of this product is higher than usual, the figure quoted in Jamaica, at the time the Consular Report was written, being 21s. per 100 lb., as compared with an average price for many years past of 15s. per 100 lb. It is stated that if more care were taken in the preparation and curing of the spice on the part of the small settlers, their product would command a higher price in the market.

Pimento growing is chiefly carried on in the parish of St. Ann, but considerable quantities are also produced in the parishes of St. Elizabeth, St. Mary, Trelawney, and Manchester.—*Agricultural News.*, Vol. VII, No. 149.

[The tree does very well at Peradeniya, but no one, so far as we know, has attempted to grow it in Ceylon on a commercial scale.—ED.]

LIST OF JUNGLE PRODUCTS USED BY THE POOR DURING THE FAMINE, 1896-97.

BY T. E. D. INNES,

Agent, Balrampur Estate.

[This is a useful list. Those plants which occur native in Ceylon are marked with an asterisk.—ED.]

SHRUBS.

1. JHARBERA (*Zizyphus nummularia*, W. and A., Nat. Ord. *Rhamnaceae*).—Ripens about in October when it is gathered and eaten as a fruit. Bread is also made from it. It was also eaten unripe during the famine, the stone being taken out, and the remainder pounded up and eaten both uncooked and also made into bread. The seeds are soaked in water, and the decoction strained and drunk as a cooling drink, and great thirst quencher. [Other species of Z. occur in Ceylon, *e.g.*, *Z. Jujuba*, the Maha-debara or Ilantai, and the fruit is eaten.]

* 2. KARAUNDA DESI (*Carissa Carandas*, L., Nat. Ord. *Apocynaceae*).—This ripens during the rainy season, and is a small berry produced on a thorny shrub, and is eaten when ripe. *Chatni* and pickles are also made from the fruit. [Maha-karamba, Sin., Perumkila, Tam.]

* 3. KARAUNDA JANGLI (*Carissa spinarum*, A. D. C., Nat. Ord. *Apocynaceae*). —This is a small berry produced on a thorny shrub and ripens in December. It is a general article of food amongst the poor who pluck and eat it when ripe. [Hin-karamba, Sinh., Chirukila, Kilatte, Tam.]

4. KHAJUR OR PALOWTI (*Phoenix acaulis*, Buch., Nat. Ord. *Palmae*).—The root is much sought after. The outside bark is removed, and the inside is split up into 4 or 5 pieces and pounded, when a coarse white flour is produced; the stringy parts are removed and thrown away and the flour ground in *chakkis* and made into bread. It is considered most edible and is much sought after, generally eaten in the cold season, as it is said to be very heating and causes dizziness when eaten in the warm weather. At the top of the root, where the very fresh green leaves start, the white soft vegetable substance between the base of the leaves and the root is eaten uncooked. The fruit of this plant ripens in April and May, and is also eaten. [*P. zeylanica*, the Indi, occurs in Ceylon.]

* 5. BHUSI DAL ARHAR (*Cajanus indicus*, Spreng., Nat. Ord. *Leguminosae*).—This is simply the dry husks over the *arhar dal*, which were ordinarily thrown away, but during the famine were kept, pounded into flour and made into bread. [Cultivated in Ceylon under the name Ratatora, Sinh., Thavarai, Tam., or Pigeon-pea.]

6. KHARHAR KA PHAL (*Gardenia turgida*, Roxb., Nat. Ord. *Rubiaceae*).—A wild thorny shrub producing a fruit like the *bel*, when unripe it is boiled and eaten, but when it ripens becomes poisonous. Fruits in June and is edible about July and August, after which it begins to ripen.

* 7. SITA CHABENI (*Grewia polygama*, Roxb., Nat Ord. *Tiliaceae*).—A jungly bush. The fruit when ripe is eaten uncooked and when unripe is parched and eaten like gram. It is more or less nutritive. The root is used medicinally. Fruits in July and ripens about January. [Bora-daminiya, Sinh., Taviddai, Tam., common in dry zone.]

* 8. MAINI (*Randia dumetorum*, Lank., Nat. Ord. *Rubiaceae*).—A jungle shrub which fruits about July and ripens about January. When the fruit is unripe it is boiled and eaten, but when it ripens it becomes rather poisonous. It is used medicinally when ripe. The jungle people use it to poison water to enable them to catch the fish. [Kukuruman, Sinh., Karai, Tam., common near coast in dry zone. Ripe fruit used as fish poison by Veddahs.]

9. DAFER OR BENDUL (*Grewia scabrophylla*, Roxb., Nat. Ord. *Tiliaceae*).—Also known as *Patra*. A jungle shrub found in sub-montane forest, produces a small round fruit which ripens in November and December. Eaten uncooked, and sweet to the taste, considered wholesome.

10. MAKOIA JANGLI (*Dioscorea glabra*, Roxb., Nat. Ord. *Dioscoreaceae*.)—The fruit of a thorny shrub found in the jungle, and eaten when ripe. Ripens about November and December. [Many species of Dioscorea in Ceylon (yams).]

* 11. PERAR (*Randia uliginosa*, D.C., Nat. Ord. *Rubiaceae*).—A thorny shrub found in the jungle, as a rule near water. The flowers and fruit are both eaten after being boiled. It flowers about June, and ripens about March, and provides food for nearly nine months in the year. Considered most edible. [Et-kukuruman, Wadiga, Sin.; edges of tanks; fruit flesh used in curries.]

* 12. BAO BIRANG (*Embelia robusta*, Roxb., Nat. Ord. *Myrsineae*).—A shrub found in the jungle, the fruit of which

is eaten when ripe. Fruits about January and February and eaten uncooked. It is also used medicinally. [Rare.]

13. GUR MASURIA. (This is probably *Antidesma diandrum*, Roth., Nat. Ord. *Euphorbiaceae.*—Hon. Ed.)—A bush found in the jungles. These leaves are boiled and eaten as a vegetable. The fruit which ripens about January or February is eaten uncooked.

14. DHOWRAI.—A shrub found in the jungle. The fruit is eaten when ripe uncooked. Fruit ripens about June. Considered most edible.

15. KATTAI.—A thorny shrub found in the jungle. The fruit which ripens about May or June is eaten uncooked. It is considered most edible.

16. SATAWAR (*Pueraria tuberosa*, D.C., Nat. Ord. *Leguminosae*).—A small shrub found in the jungle. The root is pounded and used medicinally. Supposed to give strength and increase milk supply in animals. The new shoots which appear about March are very edible and much sought after.

17. KAND MOOL.—A small shrub found in the jungles, and which is also cultivated. The root is parched or boiled, and considered most edible.

* 18. AKOHUR (*Alangium Lamarcki*, Thwaites, Nat. Ord. *Cornaceoe*).—A shrub found in *terai* jungle. The fruit when ripe is eaten uncooked. Fruits in June. [Mul-anninchil, Tam. Common.]

TREES.

* 19. TEND (*Diospyros Melanoxylon*, Roxb., Nat. Ord. *Ebenaceæ.*)—When ripe is generally eaten as a fruit. During the famine when unripe it was dried, pounded, and made into bread. It was also baked, ground, and made into a kind of *sattu*. Usually it is baked when unripe and eaten. The method usually adopted is a hole dug in the ground, and a layer of *bhusa* spread at the bottom, the fruit is placed on the *busha*, and another layer of *busha* is spread over it and then a layer of mud. On the mud a fire is kindled and the fruit slowly baked. Fruits in August and ripens in following April. [Very rare; nearly related to Ebony.]

* 20. AONLA (*Phyllanthus Emblica*, L., Nat. Ord. *Euphorbiaceae.*)—This is generally eaten when made up into a *chatni* or preserve. During the famine it was boiled ripe or unripe and eaten, ordinarily when ripe it is eaten uncooked. Fruits in June and ripens about March. [Nelli, Sin., Toppi-nelli, Tam.; common on patanas; fruit preserved.]

* 21. GULAR (*Ficus glomerata*, Roxb., Nat. Ord. *Rutaceæ*).—Generally eaten when ripe; when unripe it was boiled and eaten as a vegetable. It was also dried and pounded and made into bread. The bark also was dried, pounded, ground in a *chakki* and bread made of the flour produced. Ripens all the year round. [Attika, Sin., Atti, Tam. Common.]

* 22. BEL (*Ægle Marmelos*, Correa, Nat. Ord. *Rutaceae*).—Fruit ordinarily eaten when ripe, when unripe it was boiled or roasted and eaten. Fruits in June and ripens in April and May. [Cultivated: the Bael or Beli fruit.]

23. SAL (*Shores robusta*, Goertn., Nat. Ord. *Dipterocarpeæ.*)—The fruit of the *sal* tree is used. The kernel of the fruit was first boiled when a kind of oil came to the top and was skimmed off. It was then ground to a flour and bread made of it, and it was also parched and boiled and eaten. The oil extracted was used for lighting and was also used in the food. Ripens in July, and was a common article of diet during the famine amongst the poor.

* 24 SEMAL (*Bombax malabaricum*, D. C., Nat. Ord. *Malvaceae*).—The bud of the semal flower was boiled and eaten as a vegetable. The flower was dried, ground, and made into flour and eaten as bread. The root of the small trees is most succulent, and was eaten uncooked like a radish. The bark of the trees, small and long, was stripped, dried, pounded, and ground in *chakkis*, and bread made from the flour produced. This last not very nutritive, but quite innocuous. First buds in December and January, flowers in February and March, and ripens about April. [Katuimbul, Sin., Parutti, Tam., the cotton tree.]

* 25. BAHERA (*Terminalia belerica*, Roxb., Nat. Ord. *Combretaceæ*).—A jungle tree which fruits in June and ripens about the following March. Ordinarily the outside of the fruit is used medicinally, but in the famine the kernel of the stone inside was eaten raw, like almonds. Supposed to be nutritive. [Bulu, Sin., Tanti, Tam.; the fruits are beleric myrobalans, much used in native medicine.]

26. BHELAWAN (*Semecarpus anacardium*, L., Nat. Ord. *Anacardiaceae*).—A jungle tree which fruits about January or February. The fruit grows on the stem, and the seed protrudes from the end of the fruit. It is eaten when ripe cooked, but the seed is poisonous. [Many species of S. in Ceylon.]

* 27. PIPAL (*Ficus religiosa*, L., Nat. Ord. *Urticaceae*).—The bark of the *pipal* is dried, pounded, and ground in the *chakki*, and bread made from the flour, not very nutritive. The fruit which ripens about June is also eaten uncooked. [The Bo.]

* 28. ASARHI (*Oroxylum dicum*, Vent., Nat. Ord. *Bignoniaceae*.)—A jungle tree which produces a long flat bean-like fruit. The seed of the fruit is collected, parched, and ground into flour, and bread made of it. The seed is also eaten uncooked. Ripens in January and February. [Totila, Sin.]

* 29. BARGAD (*Ficus bengalensis*, L., Nat. Ord. *Urticaceae*.—The fruit is eaten both ripe and unripe. It fruits about July and ripens about the following June. [Maha-nuga, Sin., Al, Tam., the banyan.]

* 30. PAKUR (*Ficus infectoria*, Willd, Nat. Ord. *Urticaceae*.)—The fruit of the *pakur* tree is eaten ripe and unripe. The new shoots are also plucked, boiled, and eaten as a vegetable. The new shoots come about March, and the fruit about June. [Rare.]

* 31. KELA (*Musa sapientum*, L., Nat. Ord. *Scitamneae*).—The root of the plantain was boiled and eaten as a vegetable,

* 32. HARRA. (*Terminalia Chebula*, Retz., Nat. Ord Combretaceae.)—A large jungle tree producing a fruit which ripens about April. The peel of the fruit is used medicinally, but the kernel of the stones was much eaten by the poor during the famine. [Aralu, Sin., Kakukkay, Tam., the ink-nut, gall-nut, or chebulic myrobalan. Used in native medicine.]

(*To be continued.*)

SCIENTIFIC AGRICULTURE.

THE LOSS OF WATER FROM SOIL DURING DRY WEATHER.

On this important subject Dr. Leather, Imperial Agricultural Chemist in India, has recently published a paper (Mem. Dpl. Agri. Ind., Chem. Series I. 6. Feb. 1908). He begins by pointing out that the ordinary explanation of movement of water in the soil by simple capilarity is insufficient. If it begins to dry off from the top it will only move up from the next particles at first, then from others, and so on.

The general conclusions to which he comes from his experiments are that during a dry period water moves upwards from a limited depth only, which at Pusa (Bengal) was about 3 feet; that water evaporates at a rate depending on the amount of water present, the rate of loss being much greater immediately after rain than subsequently.—[ED.]

MEMORANDUM ON ALKALI AND WATER-LOGGING IN IRRIGATED LANDS.

BY R. W. SMITH.

The general question of drainage in cultivated lands is one which receives attention, as a rule, only when it becomes an absolute necessity. Deep gravelly soils, where cultivation is carried on with the assistance of natural rainfall only, present no difficulties in this respect. With a heavy retentive clay sub-soil the case is different, and the water-plane, or "surface of saturation," approaches more or less that of the ground surface.

2. I believe it is a generally accepted fact that with a saturation of the soil approaching 80 per cent. all ordinary plant growth (leaving out of the question aquatic plants) is arrested, and if this condition is continued, ordinary plants cannot live.

3. There are two distinct evils produced by defective drainage, and these are often mistaken one for the other. They are (1) water-logging; (2) alkali. The former is by far the most common, and this is fortunate, as in many cases it only requires a little observation and commonsense to minimize or remove the evil. This is exactly the case in irrigated lands, because the water supply is or ought to be under control. It is not so with water-logged pasture lands in Europe, for instance, as the over-saturation is brought about by excessive rainfall combined with impervious sub-soil, both of which elements are beyond the control of the cultivator. The result is that the natural feeding grasses are swamped out and have to give place to others, such as rushes, sedge, &c., which are useless.

4. As about two-thirds of the area of Ceylon are dependent mainly or altogether on artificial water supplies in the form of irrigation, it is generally easy to avoid water-logging. The remedy is simple. Turn less water on to the lands, and none at all from artificial sources when it is raining. The latter would seem to be an obviously unnecessary piece of advice, but it is nevertheless needed in many cases.

5. To those who live in the regions of tropical rains, it may not appear remarkable that natural lakes are seldom, if ever, seen. The overflow of the heavy flood waters has had the effect of scouring away the outlets of the natural depressions where lakes might have formed, and turn these depressions into continuous valleys, each with its stream beds or water-course. In a very few flat places near the sea coast some natural depressions or "villus" are found, taking the form of, say, shallow lakes or swamps. In these cases the water-plane has come to the surface all round the perimeter of the depressions. If an artificial water supply, say an irrigative tank or channel, is situated near the "villu," the surplus waters—there ought not to be any—from the field supplies find their way, partly on the surface, partly below it to the "villu," and the natural result is that the water-plane is raised still higher and more land becomes over-saturated "or water-logged" and will not grow crops. If the ordinary cultivator would read the lesson very clearly taught by this, he would see that he must not overstep the margin which marks the limits of sufficient water supply and water-logging. The only remedy for the case of such lands as are thus unfortunately situated in these natural depressions is to be found in artificial drainage outlets and then it becomes a question as to whether the lands are worth the cost. The remedy for the partially water-logged land situated between the "villu" and the higher ground is to be found in not allowing surplus waters to flow on to them.

6. There is one other point, however, which must be borne in mind, and which brings me to the second consideration in my subject. These lands which have been water-logged for an indefinite period may also have suffered from the evils of "alkali."

7. The term is rather an ambiguous one, but its application in this connection is generally well understood. The salts known as "alkali" are almost all salts of soda—chloride, carbonate, and sulphate. Some salts of potassium also appear, but they need not be considered as a rule. The sodium carbonate is the "black alkali," and the most harmful of all. I quote below remarks by Mr. Herbert M. Wilson, formerly Geographer to the U. S. Geological Survey, &c.:—

"Where the natural drainage of the country is defctive, and the strata underlying the surface are impervious or the soil not deep, irrigation or rainfall causes the sub-surface water-plane to rise to such a height that finally the soil becomes saturated. Evaporation then takes place from the surface, and as this process continues there are left on the soil the salts contained in the water. Thus, the more water that evaporates from the surface, the more alkali will be deposited, and increased rainfall or irrigation will increase the amount of alkali. It is thus seen that the direct cause of the production of alkali is the rise of the sub-surface water-plane, due to defective drainage, and the evaporation of water from the surface. * * *
Professor E. W. Hilgard's experiments show that the main mass of alkaline salts exists in the soil within a short distance of the surface, and that the amount of these salts is limited. * * *

Several preventives for the rise of alkali or the excessive soaking of the soil have been recommended, and some have been employed with success. Since evaporation is the cause of rise of alkali, the chief preventive is by reducing this to the lowest point. This may be done by mulching the soil. It is also possible to cultivate deep rooting plants or such as shade the soil and reduce the amount of evaporation or such as are least harmfully affected by alkali, thus mitigating the evil and permitting some use to be made of the land. Irrigating only such lands as have good natural drainage, and exercising care not to interfere with this, is one of the best and surest preventives of the production of alkali and water-logging. The introduction of artificial drainage produces the same effect, while in a lesser degree the same result may be obtained by the use of deep ditches or furrows which themselves act as drainage channels.

When the quantity of alkali is small, the evil effects resulting from its presence may be mitigated by the application of chemical antidotes, and lastly, relief may be obtained in some cases by watering the surface and draining off the water without allowing it to soak into the ground. This system of surface washing and draining off the salt-impregnated water is known as 'leaching.'
* * *

A cheap antidote for many alkaline salts is common lime, while neutral calcareous marl will answer in some cases.
* * *

Notable experiments have been made by Professor E. W. Hilgard, which prove the value of gypsum in neutralizing 'black alkali' or carbonate of soda.
* * *

An excellent preventive against evaporation from the soil surface and the consequent production of alkali is 'mulching.' The best mulch is a well and deep-tilled surface soil, which is kept so constantly stirred that a crust is never allowed to form. Ploughing in large quantities of straw produces also an effective mulch. The depth or thickness of this protective tilled layer is of the utmost importance . . . . . After a proper tilling to a depth of, say, 10 to 12 inches, it requires a long time for the salts to come to the surface again in sufficient amount to injure the crop.* * *

Leaching is not infrequently employed, more especially in Europe. This is practised by building temporary embankments round the land and then flooding it, after which the salt-impregnated waters are rapidly drawn or pumped off.
* * *

One of the most effective plants which can be grown on slightly alkaline soil is 'alfalfa,' which, when once established, brings to bear the action of deep roots and dense shade."

8. It may be generally taken for granted that water supplied to land in the form of irrigation is only the mechanical agent in the production of alkali, and those districts which are wind-swept, such as Jaffna, Mannar, Puttalam, and Hambantota, and where evaporation is great, are most likely to suffer from alkali. The soil, however, may modify this to a certain extent, as evaporation varies considerably in extent with the class of soil. In some experiments made in 1873 it was found that where the mean evaporation from water was 20·4 inches,

that from earth was 17·9 inches, and from sand only 3·7 inches. The velocity of the wind, too, has a great effect on the amount of evaporation. It has been observed that with a velocity of 5 miles per hour, the evaporation was 2·2 times that form one in quiet air; 10 miles per hour, 3·8 times; 15 miles, 4·9 times; 20 miles, 5·7 times; 25 miles, 6·1 times; and 30 miles, 6·3 times.

Murungan, May 12, 1908.

NOTES ON HUMUS AND THE BEST MEANS OF SUPPLYING IT.

By F. B. GUTHRIE.

Over that considerable portion of the State's arable land on which the rainfall is limited or uneven, the need of retaining within the soil whatever moisture is received as rain is one of paramount importance in the treatment of the land. The maintenance of the soil's fertility in these areas becomes largely a question of conserving this sometimes scanty supply, and soil treatment having for its object suitable means of maintaining the most favourable conditions as to moisture will claim the most serious consideration of the farmer.

As the land taken into cultivation gradually extends so as to include more and more of the area within the belt of reduced rainfall and approaching to semi-arid conditions, this question of the conservation of soil moisture becomes of increasing importance.

It far exceeds in importance the question of manuring, and it is safe to say that unless the conditions as to moisture are satisfactory, the application of manures is not likely to be of any benefit, and the money expended on their use is practically thrown away.

Apart from the question of cultivation and drainage, the maintenance of the best conditions as to water within the soil depends to a very large extent upon the presence of humus. Humus, which is derived from the gradual decay of animal or vegetable matter within the soil, is one of the most important of the soil's constituents, and any variation in its amount affects profoundly the value of the soil for agricultural purposes.

FUNCTIONS OF HUMUS.

The presence of humus in the soil increases the fertility in the following ways:—

In the first place it absorbs and retains moisture in the soil, and prevents surface evaporation. A surface soil, fairly rich in humus exercises much the same influence on the underlying soil as does a mulch of dead leaves or other vegetable matter. During the dry spells and under the influence of the hot winds usually prevalent under such conditions, the loss of moisture from the soil by surface evaporation is enormous, and in soils destitute of humus this loss is so rapid as to result in the drying up of the soil and the wilting of the crops. The final result of such conditions is the formation of scalded spots and the complete removal of the fine surface soil in the form of dust.

The humus in the soil is the ingredient which is most subject to alteration and destruction, and under dry conditions it is more or less rapidly destroyed. As soon as it has lost its moisture and become dry it is rapidly burnt out by the combined action of sun and air. So that it is exactly in those circumstances where its presence is most essential that it is most liable to destruction, and the necessity for renewing it most urgent.

The presence of humus in the oil also tends to improve the texture of the soil, lightening it and loosening it, and preventing compaction of the surface, so that it is of special value in the amelioration of stiff soils.

It is the principal source of nitrogen in the soil, and by its decay under the influence of soil organisms, ammonium salts and nitrate are produced, which are the forms in which this important element is assimilated by the plant. It is of interest to remember that the humus of arid or semi-arid regions is richer in nitrogen than that of the moister districts. This is a point of great importance with reference to the potential fertility of these soils. In point of fact from a variety of causes acting together, the soil of the dry climates are richer in plant food of all kinds than are the soils in regions of greater rainfall, consequently nothing but the absence of water prevents these from being extremely reproductive. There is, therefore, no problem which exceeds in importance that of retaining in the soil the little moisture that it receives, and any operation that exceeds in arresting even partially the unavoidable loss of that moisture deserves the highest consideration.

METHODS OF SUPPLYING HUMUS.

There are three ways of supplying humus to soils in need of this constituent, namely, by the application of generous additions of farmyard manure (in cases where this is available), by the application of compost manure, and by green-manuring, or the ploughing under of a

quickly growing green-crop (leguminous for choice). We will discuss these separately.

Farmyard Manure.

Except in some dairies or such farms on which the animals are stall-fed, the material known as farmyard manure is nothing more than the solid excrements of animals, and does not contain either the urine or the vegetable matter used as bedding which is the characteristic of farmyard manure made and used in Europe and colder countries.

Owing to the absence of vegetable matter, such manure has very little value in the formation of humus, and it is probably most economically used in the compost heap.

The Compost Heap.

The compost heap is a most valuable adjunct to the farm, and it is a very great pity that it is not frequently to be found.

A heap or pit can be made very economically, and it is of special value in that it utilizes all sorts of vegetable and animal refuse, which would otherwise be wasted, and converts it into a valuable manure, rich in vegetable matter and eminently suited for soils low in humus or subject to droughty conditions.

The principle of the compost heap is the fermentation of easily decomposed vegetable material in the presence of earth and lime. It is not only substances like peat and straw, which form the usual basis of compost heaps that are thus decomposable, but almost every kind of organic substance, both of vegetable and animal origin, can be thus composted. Dead leaves, bush scraping, saw dust, weeds, tops and stalks of vegetables, as well as bone and animal refuse, can be treated in this manner. In the case of animal refuse the operation is much slower, and substances like bones should be first crushed. It is also important to be sure that animal refuse so treated is not derived from a diseased source.

The best way of making and maintaining the compost heap will depend largely upon local surroundings.

As a general method of procedure the following will be found satisfactory:—Make a heap with alternate layers of earth, refuse, and lime. Under the term refuse is included all the refuse material of animal or vegetable material mentioned above. Cover the whole with a layer of earth. When a sufficient quantity is again collected, place it on top of the heap and cover with a layer of lime, and lastly of earth, until the heap is 3 to 4 feet high. Ths heap should be kept moist, and for this purpose all refuse water from the house, slops, urine, &c., should be added. The heap may be conveniently watered by making a hole into the interior and pouring the liquid in. The covering with earth has the object of absorbing any ammonia which is evolved in the process of fermentation and by the action of the lime.

When the heap has been prepared it must be left to itself to ferment for a greater or less time. Probably a few months will be sufficient unless very refractory substances, such as bones, &c., are present. In a few months' time it should be well forked over and another layer of lime and finally of earth should be added. In the course of another month or two it should be ready for use, and you will have provided yourself at a very slight cost an excellent manure rich in humus, and will have utilized for the purpose a great amount of refuse material which would otherwise be lost or burnt. When refuse material is burnt, the ashes, though still possessing manurial value on account of the lime and potash and phosphates they contain, are of incomparably less value than the original substances out of which they are derived, owing to the absence of humus material and of nitrogen, which have been lost in the process of burning.

Instead of a heap the compost may be conveniently prepared in a pit. In either case the bottom should be cemented, or so drained that the liquid escaping from the mass can be collected and returned to the compost.

It will be found first advantageous to prepare a second heap while the first one is ripening and being used. It will also be found that if it is desired to use more concentrated fertilizers, such as superphosphate, potash, and ammonium salts, these can be mixed with advantage with the compost manure, before being applied to the land. Used in this way they will be in less danger of leaching away, and will be of greater benefit than if applied directly to the land.

Green Manuring.

Amongst the most effective methods of supplying humus to the soil and increasing its fertility is the practice of green-manuring—that is, the ploughing under of a green crop. The beneficial action of this operation is a two-fold one: it enriches the soil, in the first place, by supplying it with a considerable proportion of readily-available plant-food; and in the second place, by

adding humus, and thus improving the soil's texture and its power of absorbing and retaining moisture. When such a crop is buried, the surface soil becomes enriched by the nourishing materials which the crop during the period of its growth has drawn from the air and from the lower portion of the subsoil, and this material is now placed within the reach of the succeeding crop.

During the growth of the plant the soil has, in addition, been stirred up and disintegrated by the development of the roots. When ploughed under, provided that sufficient mositure and warmth are present, the buried mass decomposes with more or less rapidity, and the succeeding crop gets the benefit of the fertilising ingredients contained in the decaying mass of vegetation in a readily-available form. The resulting humus is of the greatest value, not only as a source of plant-food, but in improving the soil's texture, in preventing too rapid evaporation, and in enabling the soil to absorb and retain water, thus rendering it less liable to suffer during dry spells.

A further important result is the formation of carbonic acid by the decomposition of the buried crop. Carbonic acid is given off abundantly in the fermenatation of mass, and assists in the disintegration of the soil and in rendering available the plant-food contained in it.

Green-manuring is effective both in sandy and on heavy clay soils, and, indeed on all soils deficient in humus. On sandy soils the effect of green-manuring is to consolidate the soil, the humus formed binding the particles together. On clay soils, the effect of the addition of humus and the addition of carbonic acid is to loosen and aerate them. When conditions as to warmth and moisture are favourable, and the crop decomposes fairly rapidly, the production of soluble plant-food proceeds with considerable rapidity. This is especially the case in respect of nitrogen, which is the principal manurial ingredient. Nitrification (that is, the conversion of the nitrogenous material of the plant into soluble nitrates) takes place quite rapidly. In sandy soils, green manure nitrifies more rapidly than manures like dried blood, bone-dust, &c., and only less slowly than ammonium sulphate; while in stiff clay soils the green crop nitrifies very much more ra-rapidly than either sulphate of ammonia or animal manures.

With regard to the kind of crop to be used for the purpose of green-manuring, a good deal of latitude is permissible. Any crop that is rapid and luxuriant in growth, and that can be readily turned under, is suitable for the purpose, and the selection will be guided by considerations such as the time of year at which it is to be grown, its suitability to soil and district, &c. Amongst the most effective class of crop for the purpose are leguminous plants, such as clover, cowpea, lupines, &c., since these are specially valuable on account of their power of obtaining their nitrogen from the air. They are, therefore, especially suitable for soils poor in nitrogen, and are of high value in enriching the soil with this ingredient. There are, however, many other crops which are suitable for the purposes, and frequently used, such as mustard, buckwheat, &c. These are all rapid growers, and can be grown as catch-crops—that is to say, after the main crop has been harvested and before the succeeding one is sown. The practice of growing a crop of tares or vetches after the wheat crop has been harvested is very common in Europe, and can be followed successfully here in districts where the autumn rainfall is sufficient. Such a catch crop occupies the ground at a time when it would be otherwise unoccupied, and, during its growth is collecting plant-food from air and soil, which is utilized for manuring the succeeding crop.

The practice of green-manuring is of special value in orchard work, where the green crop can be grown and ploughed under between the rows.

It must be borne in mind, in all cases, that green-manuring depends for its success upon conditions favourable to the decomposition of the buried green crop, namely, sufficient warmth and moisture. A crop ploughed under in the late autumn or winter will nitrify only slightly, and the same applies to ploughing under a crop in a dry season. If the land is quite dry the crop will remain buried without decomposition for a considerable period, and its benefit is lost.

PROPORTION OF NITROGEN SUPPLIED TO SOIL BY GREEN MANURING.

With regard to the actual amount of material supplied to the land by ploughing under a green crop, some experiments were carried out at the suggestion of Mr. Allen, the Fruit Expert of the Department.

The produce of one spuare yard of crops of vetches, at Wagga, Bathurst, and Hawkesbury College, was harvested carefully, tops and roots, and forwarded for analysis. In the case of the Wagga sample, the roots were obtained by washing away the soil, and Mr.

McKeown calculates that he succeeded in obtaining 95 per cent. of the total weight of root in the soil. The produce of tops from one square yard was 4 lb. 14½ oz., or 10 tons 12 cwt. per acre; and of roots, 11 lb. 9 oz. per square yard, or 3 tons 7 cwt per acre. Analysis showed that the tops contained 87 per cent. water (13 per cent. dry matter), and 506 per cent. nitrogen; the roots contained 83 per cent. water (17 per cent. dry matter), and 213 per cent. nitrogen.

When, therefore, this crop is ploughed under, it will add to each acre of the soil, in the shape of dry matter, 1 ton 7 cwt. tops, and 11½ cwt. roots, including 120 lb. nitrogen from the tops and 16 lb. nitrogen from the roots; a total of 136 lb. nitrogen per acre. Assuming that conditions are favourable for nitrification, this will be equivalent to a dressing of nearly 7 cwt. sulphate of ammonia per acre, or over 11 cwt. dried blood—an enormous dressing.

The soil in which this crop was grown was a light loam with about 25 per cent. clay. The clay is of a tenacious character, and has a tendency to cake hard on drying. The soil is low in humus, containing only about 4 per cent of this ingredient. It is fairly rich in potash and satisfactorily supplied with lime, but rather low in nitrogen and phosphates. It is consequently just the type of soil in which green-manuring should be effective, as the effect of ploughing under the crop will be to break it up and render it more friable, and to supply the deficiencies in humus and nitrogen. Its efficacy is, of course, dependent upon conditions as to rainfall being favourable to its decomposition in the soil. The climate of Wagga is not very favourable to the growth of these crops.

At Bathurst, and at the Hawkesbury College, where conditions are more favourable the benefits of green-manuring are even more striking. Mr. Allen obtained samples of tops and roots, representing the produce of one square yard from crops grown at these places, and they gave the following figures :—

At Bathurst, the tops weighed 17 lb. and the roots 2 lb. 5 oz. per square yard, or 36 tons 14 cwt. tops and 5 tons of roots per acre, giving a total of dry matter to be ploughed under of 4 tons 15 cwt. from the tops and 16 cwt. from the roots. Assuming the same nitrogen content in tops and roots as was found in the Wagga plants, this will give when ploughed under 411 lb. nitrogen per acre from the tops and 22 lb. nitrogen from the roots.

At Hawkesbury, the produce was 21 tons 12 cwt. tops and 4 tons 14 cwt. roots per acre. When ploughed under, this would yield 2 tons 16 cwt. dry matter from the tops and 16 cwt. dry matter from the roots. With ·5 per cent. nitrogen in the tops and ·2 per cent in the roots, the soil will be enriched in nitrogen by 242 lb. per acre from the tops and 22 lb. from the roots.—*Agricultural Gazette of New South Wales*, March, 1908. Vol. XIX, Part 3.

THE SOURCES AND USE OF NITROGENOUS MANURES.

(Abstract of "Die Stickstoffquellen und die Stickstoffdungung," by W. Schneidewind.)

Of the various constituents of commercial fertilizers nitrogen is undoubtedly the most expensive. Not a little skill and intelligence are required on the part of the farmer, for placing before the growing crops a proper supply of nitrogen food in a manner both economical and efficient. The growing cost of nitrate of soda, the increasing production of sulphate of ammonia, the more or less successful attempts to manufacture nitrogenous materials out of the nitrogen gas in the air, and finally the various systems of green manuring and tillage are factors to be reckoned with. The situation is thus decidedly confusing, even to the progressive farmer, and it is not always easy for him to determine the best methods to be pursued.

Apart from the nitrogen removed in crops, gains and losses of this constituent constantly occur in the soil. Quantities of nitrogen compounds are brought to the soil in the rain, dew and snow; further additions occur through the absorption of ammonia from the air by the soil humus, and through the building of such compounds by bacteria living directly in the soil or in the root nodules of leguminous plants. On the other hand, the store of nitrogen in the soil may be diminished in various ways. The decay of the soil humus, which is caused by bacteria, involves the breaking down of nitrogenous compounds and the setting free of some of their nitrogen. Moreover, a portion of the nitrogen may be lost by the formation of ammonia and its partial escape into the air. Fully as important as these two is the leaching out of the soil of very considerable quantities of nitrates, themselves derived from the decay of humus, of manure and of animal or vegetable substances in commercial fertilizers.

Insofar as the increase of combined nitrogen in the soil is concerned, the amounts brought down in the rain and snow, or absorbed as ammonia from the humus, are of minor importance. They do not exceed a few pounds per acre annually. On the contrary, the gain of nitrogen compounds in the soil through the agency of bacteria is very important. It was largely through the work of these microscopic beings that our soils have been enabled to accumulate their store of nitrogen, and their work in the present is no less important than it was in the past. A better knowledge of these bacteria must prove of great benefit to every farmer, since such knowledge will enable him to utilize them to the best advantage in providing nitrogeon for his crops.

Among the conditions which must be met in order to render the soil a suitable medium for the rapid and vigorous growth of nitrogen-gathering bacteria are those of moisture, humus and mineral salts. Bacterial life soon comes to a standstill in soils deficient in moisture. Similarly, bacteria as living things must have food, and this they find in the humus. Hence humus is important not only as a source of food to bacteria, but also in creating conditions favorable for their development, since the greater the amount of humus the greater the amount of moisture in the soil, and the greater the amount of moisture, the more rapid the growth of the bacteria. We should remember likewise that bacteria are after all only minute plants, and as such they need a supply of available lime, phosphoric acid and potash. Soils poor in these constituents are unsuited for the intense growth of bacteria and therefore are unsuited for the vigorous growth of crops. The need of large quantities of mineral plant food is particularly prominent in the case of leguminous crops, crops which form a partnership with bacteria in their roots and become enabled thereby to draw lavishly on the vast store of nitrogen gas in the air. The clovers, lupines, alfalfa, the vetches, etc. thus create a supply of nitrogen not only for themselves but also for the non-leguminous crops which feed on their decaying remains. It should be remembered, however, that in this process of nitrogen-accumulation by legumes, large amounts of lime, phosphoric acid and potash are used up; hence the best results in the utilization of atmospheric nitrogen by leguminous crops can be secured only where ample provision is made for the supply of the mineral ingredients of plant food. Repeated experiments have demonstrated that under favourable conditions leguminous crops may contain 100 to 200 pounds of nitrogen per acre, most of it derived from the air. It is evident thus that with an abundance of lime, phosphoric acid and potash, the accumulation of atmospheric nitrogen by legumes is only governed by climatic conditions, and by the numbers and vigor of the bacteria in the root nodules. If is for this reason that soil inoculation, that is, the introduction into the soil of large numbers of the desired bacteria, may under suitable conditions prove of great advantage to the farmer who would make use of atmospheric nitrogen by means of leguminous crops.

The different methods of soil-treatment largely aim either to conserve the nitrogen compounds already in the soil, or to add to their amount by applications of nitrogeneus material. We may note among these methods of treatment fallowing, green-manuring, the application of barnyard manure and the application of nitrogen salts or of other commercial forms of combined nitrogen.

Fallowing was once an essential part of farm practice, for it was believed that soils need rest, and practical experience had really demonstrated that larger crops could be raised after bare fallows than could be secured in the continuous growing of crops. With the introduction of hood crops the practice of fallowing lost ground, for it was recognized that it was, on the whole, a wasteful system. More recently fallowing has been made the subject of much discussion. The discovery of nitrogen-gathering bacteria living by themselves in the soil. and likewise of the fact that they grow abundantly in bare fallows has led to the belief that they may become an important means for the utilization of atmospheric nitrogen. The experimental evidence available, however, fails to support this view, and we must regard fallowing as a method extremely wasteful of plant food.

Whatever the value of fallowing as a means of increasing the nitrogen content of the soil, the efficiency of green-manuring for this purpose has been effectively demonstrated. Green manuring has proved most successful on light soils, not only because such soils compel the leguminous crops to utilize extensively the nitrogen of the air, but also because these crops decay rapidly when incorporated into sandy land, and furnish thus an abundant supply of available nitrogen food to succeeding non-leguminous crops. A brilliant demonstration of the significance of leguminous green manures on sandy soils is furnished by the classical work of Schulz-Lupiz. He

was notably successful in securing vast quantities of nitrogen from the air by growing lupines and other legumes abundantly provided with potash and phosphoric acid. Among the crops noted for their ability to utilize the nitrogen of green manures may be mentioned sugar beets, potatoes and also mangels. For the best utilization of green manure nitrogen potatoes and beets should receive 45 to 55 pounds of phosphoric acid per acre, preferably as phosphate. An abundant supply of potash is even more important. An application of 95 to 100 pounds of actual potash, either in kainit or in muriate, may be utilized by large crops of potatoes or beets.

Animal manures while containing all the elements of plant food owe their effectiveness largely to their nitrogen. Fresh manure may contain on the average 0·5 per cent. of nitrogen; that is, 10 pounds per ton. Well rotted manure, carefully kept, may contain 0·6 to 0·75 per cent. of nitrogen. Apart from its plant food, animal manure may play an important role in the soil, because of its organic matter, that is humus-forming material and its countless number of germs. Thanks to these, it hastens the transformation of plant food in the soil, and it is for this reason that the highest crop yields are secured on most soils only where manure and commercial fertilizer are used together.

The high grade commercial nitrogenous materials are prominently represented by nitrate of soda and sulphate of ammonia. To these may be added the so-called lime nitrogen or calcium cyanamide made in Europe at the expense of atmospheric nitrogen, and likewise the nitrate of lime made by another method in Norway. The latter two are made under patents held by European scientists and with the aid largely of cheap water-power. A pound of nitrogen derived from each of these materials, or from still other nitrogenous substance, has an unequal value. The nitrogen in nitrate of soda and nitrate of lime possesses the greatest value; the nitrogen in ammonia salts and calcium cyanamide has a somewhat slighter value. Then follows the nitrogen in dried blood, tender leaves and stems of clover or of other legumes, the nitrogen of manure, etc. in the order named. The unequal value of the nitrogen from different sources should be ascribed to the different amounts of transformation these materials must undergo before they are fit to nourish the crops. These values are further affected by the character of the soil, climate and crop. The influence of the last-named factor is shown, for instance, by the fact that beets prefer nitrate-nitrogen to ammonia-nitrogen, whereas potatoes will use one as readily as they will use the other.—*Louisiana Planter and Sugar Manufacturer*, April 11th, 1908.

THE CENTRAL AGRICULTNRAL COMMITTEE, MADRAS.

MEMORANDAM ON THE INTRODUCTION OF IMPROVED PLOUGHS IN THE TINNEVELLY DISTRICT.

The following notes on the introduction of the light iron plough and the single seedling system of planting paddy into the Tinnevelly District are printed for circulation.

2. They are instructive as showing the methods by which success may be achieved, the obstacles with which the introduction of improvements in Agriculture are met, and the way by which these may be removed.

3. The two points which seem to be clear are: *first*, that the 'improvement' must possess advantages easily capable of demonstration, and, *second*, that as many members of the Association as possible should demonstrate the improvement on small pieces of their own lands in as many centres as possible. The Central Agricultural Committee will be glad to hear of any similar attempts made by Associations to introduce improvements together with an account of the difficulties experienced in their introduction and the objections urged by ryots against them.

METHODS OF INTRODUCTION OF THE IRON PLOUGH IN THE TINNEVELLY DISTRICT.—At the time of the Agricultural Exhibition held in Tinnevelly in 1905, Messrs. J. Dharmaranga Raju and J. Chelvaranga Raju demonstrated the working of the various implements sent from Koilpatti and Saidapet farms, notably the iron plough (*Neelakanta Asary's plough*) with cattle ordinarily used by ryots by the side of the Tinnevelly-Palamcottah road both in puddle and in dry lands. This attracted the attention of several ryots who attended the Exhibitions. Messrs. J. H. B. Jackson, D. G. Waller, and D. T. Chadwick were also present during the demonstration and took a very keen interest in it, and appreciated the superiority of the improved over the country plough. These Divisional Officers drew the attention of some of the leading Mirasdars of their divisions to the usefulness of the improved plough, and for some time after the Exhibition, several ryots enquired about the working of the iron plough from time to time and

desired the practical demonstration of the implement, and their requests were complied with. When the working scheme of the Agricultural Association was being drafted, a Committee, consisting of Messrs. D. T. Chadwick, Rao Sahib T. Raghaviah, J. Dharmaranga Raju, J. Chelvaranga Raju and V. P. Subramania Mudaliar, sat and discussed the best methods of introducing the improved ploughs to the ryots of this district. It was suggested by Mr. J. Chelvarang Raju that the Association should own a few pairs of cattle and let them for hire to such of these ryots who wanted to work their lands with the improved plough and also demonstrate the same in important fairs and festivals in the district. The suggestion was approved of and carried out by the Association. During the demonstrations with the Neelakanta Asary's plough, some defects were noticed in it which were rectified by Mr. J. Dharmaranga Raju, who designed a new form of the plough suitable for both wet and dry methods. Arrangements by the Agricutural Association were made for the manufature of ploughs through Mr. J. Dharmaranga Raju who engaged a smith at Palamcottah for the purpose. The ploughs were constantly at work on wet and dry lands near public roads for some hours every day, and the ryots had opportunities of observing the usefulness of the implements and its workability with the aid of ordinary sized cattle of the locality. Ploughing demonstrations were also conducted by the Agricultural Association at the cattle fairs at Sivalaperi and Alwartirunagari and also at Tinnevelly, Palamcottah, Krishnapuram, Mélappálaiyam in Tinnevelly Taluqs and at Pathamadai and Sérmádévi in the Ambásamudrum Taluqs. During the Jamaband iof Tinnevelly and Sankaranayinarkóyil and Ottappidáram Taluqs, Mr. J. Dharmaranga Raju demonstrated the use of improved ploughs at the various Jamabandi camps. Demonstrations were also given by him during his tours in Tinnevelly and Sankaranayinárkóyil Taluqs, and in Kalloor where a weekly fair is held, and at Kazhugumalai where an important annual cattle fair is held. Mr. A. Rama Row of the Sivagiri Home farm purchased ten ploughs from the Agricultural Association and worked in the Sivagiri Home farm lands, which attracted the attention of the ryots of the locality. There being a local demand for about fifty ploughs at and around Sivagiri, Mr. A. Rama Row has induced a local smith at Sivagiri to undertake the manufacture of the ploughs, and a few ploughs so manufactured are already in use at Sivagiri.

Number of Iron Ploughs in use.—The statement showing the particulars of the number of ploughs sold by the Agricultural Association, Tinnevelly, has already been submitted. The Agent who supervises the sale of iron ploughs having failed to note the names of purcheasers from time to time, an accurate list could not be given. The statement was prepared from particulars gathered from the accounts kept by the smith (manufacturer). About 300 ploughs may be taken to have been distributed by the Association, some of which appear to have been purchased by royts of other districts also.

Opinions of Ryots as regards its Advantages and Disadvantages.—The general objection to the introduction of this plough is the vague fear that it requires larger sized and more costly cattle to work it. The fear appears to have been created in the minds of the royts by the efforts made by the Agricultural Department some years back to introduce the Swedish plough.

(1) The ryots actually see that greater amount of work is turned out by the improved plough and draw the inference that the improved plough must necessarily cause very great strain on the animals, and they express the fear that their cattle would be unequal to the task if employed constantly as in the ordinary plough.

(2) They also say that the plough is not suited for all classes of soils.

(3) Another important objection raised by the ryots is the difficulty of getting them repaired in case of accidents. Spare shares are given whenever they are wanted, and yet this fear has not been removed from their mind.

(4) Another objection pointed out is that the implement is too heavy to be carried to the fields, and that the weight of the implement must necessarily increase its draught.

(5) They also contend with some degree of truth that as the implement works deeper than the country plough, it brings up the hitherto unstirred subsoil which would necessitate the use of very large quantity of manure which they could not easily afford.

(6) The ryots doubt seriously if the implement could be worked by any one except skilled and specially trained coolies.

(7) As working parts of the improved plough are made of iron, the ryots fear that serious injury will be caused to the legs of cattle.

(8) Some of the ryots object to the use of this plough in dry lands intended to be sown with gingelly, horsegram, and the like, and they argue that, as the soil is ploughed deeper rain water accumulates in it and results in making the lands sour and the consequent decay of the roots of the crops.

(9) Another objection to the introduction of the improved plough is that it is unsuited for covering seed immediately after sowing, for which purpose the country plough is used at present.

(10) The initial cost is the chief objection to the introduction of the improved plough. However, the ryots who have actually used improved ploughs in their lands and who have really seen the better work turned out by it reject all the above said objections as frivolous. From the enquiries I made of the several representative ryots who are using the plough, I was struck with the opinion expressed by them in favour of the ploughs and by the manner in which they appreciated its work. *The chief obstacle* against the spreading of this useful implement, in my opinion, is the unfavourable opinion expressed by *village smith* in every village who are invariably consulted by the ryots as to their adaptability. The fear of the village smith is that if the ryots come to know of the durability and usefulness of the implements, they would dispense with the services of the local smith who at present ekes out his livelihood by constant repairs effected to the country plough. The smith gets *a fixed quantity of grain every harvest from every ryot at so much for each plough maintained* for his services in repairing the agricultural implements. It is the wish of every village smith to impress the ryot of his own importance by making him wait upon the smith every now and then for constant repairs of the crude plough, and he naturally fears that if the ryots come to know that they could avoid the trouble of attending upon smiths by the purchase of an improved plough and spare working parts, they would belittle the importance of the smith and treat him with indifference, which would seriously affect his pesent *constant income* in each harvest season. This is the chief reason why the smith always discourages the use of improved plough by ryots, and the ryots seem to have implicit confidence in the smith. However, in course of time there can be no doubt that the eye of rural population would be opened to the superiority of the improved plough, and that it would generally replace the ordinary plough in due time.

SINGLE SEEDLING SYSTEM OF PLANTING PADDY.—The attention of the Agricultural population in the district has been drawn to this subject more than once by articles in the *Madras Mail* and in other newspapers and journals in vernacular, and also by a reprint of the article in the form of a bulletin circulated by the Central Agricultural Committee to the members of the Agricultural Association, Tinnevelly. The first trial of the experiment was made by M. R. Ry. S. Sankaranarayana Aiyar, Clerk, Government Secretariat, on his fields at Sérmádévi, and by his brother Mr. Narasima Aiyar at Srívaikuntam. Similar experiments were also conducted by M. R. Ry. A. Rama Row at Sivagiri Home farm, and by Mr. Nilakanta Iyer of Gopalasamudrum. Lectures in vernacular were delivered at Sankaranayinárkóyil and other places by Mr. Dharmaranga Raju regarding the benefits of single planting. This was actually experimented on a large scale on about 8 acres of land at Palamcottah by Mr. J. Chelvaranga Raju which attracted the attention of several ryots who had opportunites of going to Palamcottah during the cultivating season. This led to several individual experiments being made in villages like Puliyangulam, Kodaganalloor, Pappankulam, Aladiyur, etc. The following statement shows the extent under single planting in the district as far as could be ascertained by me :—

Name of the Taluq.	Extent. Acre.	Cent.
1. Tinnevelly ...	10	47
2. Srívaikuntam ...	7	28
3. Ambásamudram ...	1,237	15
4. Nángunéri ...	20	50
5. Srīvilliputtūr ...	2	—
6. Sankaranayinárkóyil	1,033	94
7. Tenkási	2	80
Total ...	2,314	14

It would appear from the above statements that the extent under single planting is comparatively large in and around Sivagiri. This is chiefly due to the active efforts of Mr. A. Rama Row (Home Farm Superintendent) who has been instrumental in forming an Agricultural Association there, consisting of several intelligent and practical ryots who had opportunities of observing the condition of the crop at its various stages and of noting the results personally, which circumstance enabled them to adopt the system on a large scale without any fear as to its results, so much so that nearly one-tenth of the area under paddy near Sivagiri may be said to be under single planting. Another place in which the system has been

readily adopted is Pappankulam and the adjacent villages where the ryots have long been familiar with the system known as Pathiyam or Sathu, *i.e.*, having a second nursery before transplanting and of economising seed and seedlings. It is a noteworthy fact that both in Sankaranayanárkóil and Ambásamudram Taluks whenever the second nursery is used, a smaller quantity of seed is sown within a given area as compared with other Taluks. The seedlings are consequently thick and strong and the ryots have understood the advantage of planting a smaller number of seedlings about 3 to 5 in each tuft, while the practice is to plant from 10 to 20 seedlings in other parts of the district. The ryots being already familiar with the economy of seed and seedlings have readily adopted the system of single planting even in Pathiyam, (*i.e.*,) when transplanted from second nursery which is a further improvement in the economy of seed.

Objections.—The chief objections raised by the ryots to this system are :—

(1) The transplanted seedlings will rot and decay if there be an excess of rain or an excess of water-supply, and that the system cannot therefore be successfully adopted in low-lying lands.

(2) Single planting will give room to the abundant growth of weeds.

(3) Unless the land is naturally rich or is heavily manured, the system cannot produce good results.

(4) The yield of grain would be less; because the popular belief is, that, one grain planted would yield only 21 grains in an average crop, on which supposition the standards of measures and land measurements have been regulated in this district. Twenty-one marakals are therefore taken to constitute one *Kottah*—which is the highest standard of measurements—(112 Madras measures) of grain, and the extent of land from which this quantity of grain is ordinarily obtained is taken as 1 marakal (*i.e.*) 8 cents. So the popular belief is that the less is the quantity of seed sown the less should be the yield.

(5) The yield of straw will be less.

(6) A larger extent of nursery would be necessary for the single planting system to produce vigorous plants.

(7) The central stock which was planted first matures quicker than the subsequent tillers, and consequently there is much loss sustained by shedding of grain.

(8) The system will entail more labour for planting as detaching of single seedlings would take more time.

(9) There is a greater risk of the single plants being damaged to a larger extent by insect pests and diseases.

The above are very frivolous objections as has been proved by experience. Owing to their sowing in nurseries, seedlings are always thick and vigorous, and when planted singly withstand any amount of rain and stagnation of water. A single stool has, on an average, ten tillers all bearing ear heads, and the number of grain in each ear-head-being on an average 150. Thus for each seed, 1,500 grains are obtained. This proves the absurdity of the popular belief as to yield. It has to be admitted that the expenses of weeding are a little higher in single planted area than elsewhere; but the idea that the cost of transplanting would be greater is incorrect. From experience, no special damages result from the late maturity of the ear heads from tillers. On the other hand all the ear-heads are of uniform length in single planted area and the grain is close packed. The number of grain in each ear-head of ordinary planting averages 100, in places where single planting yields on an average 150 per ear-head. The system of the ordinarily planted paddy being thin, the crop lodges when the grain is ripening, while the single planted crop stands erect even after maturity. Experience has also shown that the gross yield of a particular area is in no way less than that planted in an ordinary way. The quantity of straw appears to be less in single planted lands, but the yield of straw by weight is almost equal to that of the crop planted in the ordinary way. The popular fear that single plants are liable to be destroyed or damaged by disease or insect pests, has been proved to be incorrect; the reason being that the single seedlings are sturdy and healthy and consequently resist attacks of disease and pests.

The system of single planting has been in practice only for the last two or three years. Within such a short time it has spread well and is being appreciatad by ryots. There is not the slighest doubt that this system would spread throughout the district within the near future.

H. E. HOUGHTON.

P. RAJARATNA MUDALIAR,

Honorary Secretaries.

LIVE STOCK.

BEE-KEEPING AS A RURAL INDUSTRY.

Until about sixty years ago bee-keeping in this country could hardly be considered an industry; still less could the terms "art" and "science" be applied to it. Now it can be included in each of the three categories. It is true that for centuries the value of honey and wax has been well known, and much attention has been, with some success, given to the natural history of bees; but the methods of management continued to be of a very primitive kind, and yielded comparatively poor results. The places in which swarms were found, or were induced to live, were simply cavities in rocks, natural or artificial hollows in tree-trunks, earthenware vessels of different shapes, and, in later times, straw hives or "skeps." All these receptacles not only presented considerable difficulty in getting combs of honey out of them, but, what is in the eyes of modern bee-keepers a matter of still greater moment, they necessitated the slaughter of the bees before their stores could be taken. With the advent of hives containing movable frames bee-keeping was entirely revolutionized. Through this appliance not only was an end put to killing the bees, but now the condition of any stock as to healthiness and sufficiency of food can be easily ascertained, and necessary treatment can be given; weak or queenless stocks can be united; artificial swarms can be made; young queens substituted for old ones; and, moreover, it can be said, without exaggeration, that under skilful management three or four times more honey can be secured than was obtainable under former conditions of working.

Several other circumstances have contributed to raise bee-keeping to the rank of a science and art. First, there has been a considerable output of excellent literature on the subject. Guide-books, brought up to date, have been issued at prices which even cottagers can well afford. Researches relating to diseases of bees have been successfully carried on, and suitable remedies can now be applied. But perhaps the most efficient means of advance have resulted from the institution of the British Bee-keepers' Association 34 years ago. Its objects were stated to be "the advocating of more humane and intelligent treatment of the honey-bee; the bettering of the condition of the cottagers of the United Kingdom by the encouragement, improvement, and advancement of bee-culture; and, further, the increase of the home supply of wholesome food." The purposes thus set forth have been kept strictly in view, and have been successfully brought out. Then, also, help and advice have been given in the formation of county associations of bee-keepers; and of these no less than 28 are, at the present time, in affiliation with the parent association. Each of these has for its President some lady or gentleman of position and influence. Princess Christian has graciously taken the headship of the Berkshire Association, and Princess Henry of Battenberg that of the Isle of Wight.

Further stimulus to bee-keeping is annually given by exhibitions of honey, hives, and various appliances, for which valuable prizes are awarded, also by lectures and manipulations illustrative of bee-keeping, and largely by tours of experts to as many apiaries as are known to secretaries of the county associations. These experts are holders of certificates granted after examinations by the British Bee-keepers' Association. The certificates represent three grades of proficiency, the two higher ones being obtainable only by candidates showing considerable knowledge and abitity, both theoretical and practical. Again, very important services are rendered to bee-keepers all over the country by the *British Bee Journal*. This excellent weekly periodical is edited by two gentlemen of large experience and very wide acquaintance with the literature and working of apiculture. Reports of the meetings of the British and county associations are given. Questions are asked of the editors by bee-keepers who find themselves in all sorts of difficulties, and, as both inquiries and replies are printed, a large amount of useful information is thus supplied for the general good.

As to the actual number of people with apiaries, no thoroughly trustworthy statistics for the whole of England are in existence. Careful inquiries have, however, been instituted in several counties, and the best authorities have computed that in the British Isles there are 90,000 bee-keepers, and in England alone there are about 63,000 in our rural districts. The honey imports from abroad, amounting in value to more than £30,000 per annum, show that the home production is not equal to the demand. Moreover, the low price of the foreign product proves the superior quality of what is obtained from our own bees.

The passing of the Small Holdings Act opens up a new vista for several minor industries. In fact, for the successful working of the Act more than one item in *la petite culture* will be requisite. The keeping of pigs and possibly of goats; the rearing of poultry, and the planting of many kinds of fruit trees will doubtless receive

considerable development. Noteworthy periods of time, however, will be needed before any large returns come from these sources for the expenditure of capital and labour. Bee-keeping, on the other hand, may show a profit worth having in the first season in which it is undertaken, and when fair amounts of knowledge and skill have been acquired, a high rate of interest on the outlay may be definitely expected. In elucidation of this statement we may mention that in May or June—the most favourable months for beginning an apiary—well-stocked hives may be bought for from 25s. to 35s. each. If swarms are preferred they may be had at prices varying from 10s. to 15s., and new hives for their reception, with frames furnished with sheets of "foundation" can be had for sums ranging from 15s. to 25s. Now since, taking an average of years, the best authorities on the subject allege that a return of £1 per hive may be looked for annually, it is evident that bee-keeping skilfully carried on is very profitable from a money point of view. That the above estimate is by no means exaggerated may be seen from the fact that with modern methods and experienced management, it is no uncommon event for from 50 lb. to 60 lb. of surplus honey to be taken in one season from a single hive. Under the antiquated plan of keeping bees in "skeps" (old-fashioned straw hives), a yield of 15 lb. to 20 lb. was considered very satisfactory, but the honey squeezed out of the combs was often far from good in quality, being mixed with undesirable *débris* from the cells. The means by which present-day methods effect such vast improvements in both the quantity and purity of the produce taken may be briefly described.

The term "foundation" refers to thin sheets of wax uniformly impressed with exact reproductions of the bases of the cells which bees construct. These sheets, cut to fit either "sections" or "shallow frames," and fixed in them, are of immense advantage to the bees. In the first place, since from 14 lb. to 15 lb. of honey are consumed by the workers for the secretion of 1 lb. of wax, a great saving of vital energy is secured by the artificial "foundation" of combs. Then, too, since considerable time and a state of quiescence are needed for the elaboration of wax by the organs devoted to it, a further great advantage accrues from the use of the impressed sheets, inasmuch as they supply space on both sides on which the bees may immediately set to work. The "sections" are little sideless boxes $4\frac{1}{4}$ in. square. They are arranged in crates carrying 21 each, and these are placed above the brood-box so soon as the latter is crowded with bees. "Shallow frames" resemble those which are used in the brood-chamber, but are less deep by $2\frac{1}{2}$ in. When these frames are filled with honey sealed over by the bees, they may be lifted from the hive. The cappings are then carefully sliced off, and the combs may then be completely emptied by being whirled round in an apparatus for the purpose, called an "extractor." The emptied combs being replaced on the hive are immediately cleaned up, repaired where damaged, and speedily refilled by the busy workers. The process of extracting may be repeated twice or thrice in favourable seasons where bee-pasturage abounds, and by this method more than 1 cwt. of honey per hive has often been obtained. When "sections" are used, a second crate may be put below the first so soon as this is well on towards being filled. The two are then left on the hive till the forwardest one is quite completed—that is, till all the cells are sealed. In fortunate circumstances a tier of three crates may frequently be employed. Each section when filled weighs 1 lb. A good shallow frame will yield from 3 lb. to 4 lb. of honey, and as a crate usually holds 10 frames, it is easy to understand how successful bee-masters reap, by modern appliances, a large harvest of their special produce.

Two or three other points deserve brief consideration. One is that bee-keeping opens up an array of deeply interesting and most striking facts in natural history. Any good text-book on the subject will abundantly confirm this statement. Then the pursuit easily becomes a most attractive hobby. An old French writer says, indeed, *on n'aime pas les abeilles: on se passionne d'eux*, and this is commonly verified by experience. Again, the occupation is one eminently suited for women, as it does not entail going out of doors in bad weather to supply food, and is not open to the objections incident to the breeding of various domestic animals. As a matter of fact, not only are many of the lady students at our agricultural and horticultural colleges taking up the study and practice of apiculture, and becoming certified experts, but throughout the country hundreds of women and girls manage, or help in the management of, thousands of stocks of bees. Nor need timid people be afraid of being stung. Adequate protection may be secured by wearing a veil and gloves, and, moreover, the bees can be completely subdued and controlled by a few puffs of smoke from an appliance for the purpose, or by the use of a cloth sprinkled with dilute carbolic acid.

Another very important point is the intimate relation between insects and our crops, of fruit. Nearly all the blossoms of our orchards and fruit gardens are dependent for proper pollination on the agency of bees. Hence it is a well-known fact that apples, pears, plums, cherries, peaches, apricots, nectarines, strawberries, raspberries, currants and gooseberries all yield much better results where some stocks of bees are kept in their neighbourhood. That honey is not only a very palatable, but also a most wholesome, article

of diet might be shown from its chemical constituents and from the special nature of the two sugars it contains. Moreover, its value as a remedial agent, especially in throat and bronchial troubles, is well known. This may be due not merely to its emollient nature, but also, perhaps, to a fact of quite modern discovery. Most people imagine that the sting apparatus of the bee is solely to act as a weapon of offence and defence. The truth is that its primary use is widely different—viz., to inject into each filled cell of honey before it is sealed a minute drop from the "poison-bag." The chief ingredient of the liquid is formic acid, which acts as an antiseptic, and prevents fermentation, which would otherwise occur in the honey. Possibly it is this very small, but powerful, element which has medicinal properties of an advantageous kind.

As to literature which may be recommended for those who wish to pursue the subject, we may mention Cheshire's two volumes on "Bees and Bee-keeping," and Cowan's admirable little "British Bee-keeper's Guide Book." For those who wish for poetry mingled with science there is, of course, Maeterlinck's "Life of the Bee.—*London Times*, April 24, 1908.

MILK SUPPLY AND DAIRY SANITATION.

A recent number of the *British Medical Journal* contains a useful and interesting article on Milk Supply.

The Central Hospital Council for London which represents twenty hospitals appointed a Committee to adopt measures calculated to ensure the purity of the milk supplied to these institutions.

This Committee recommends that the milk supply should be undertaken on the following conditions:—

1. That the milk shall be pure, genuine, without any kind of addition (including preservatives), with all its cream, and containing at least 3·25 per cent. of butter fat.

2. The hospital authorities are to be informed of the name and locality of the farm from which the milk is supplied, and the farm should be open to inspection.

3. That the cows supplying the milk shall be in a good state of health, in proof of which a Veterinary Surgeon's certificate is to be produced.

4. That the milk shall be strained and cooled to the temperature of cold water—not exceeding 60° at the farm, and there canned and sealed with a die to be supplied by the hospital, and that all cans shall be dust and rain-proof.

5. That the cleanliness of the milking operation and of the milkers' hands be guaranteed, and that the receptacles into which the milk is put be properly cleansed with a solution of boiling water and soda.

6. That the milk shall not be pasteurized or treated otherwise than being subjected to the straining and cooling process referred to above.

The Editor of the *British Medical Journal* commenting on this last condition states:—"Already, therefore, we have reached the point at which the responsible representatives of the chief hospitals in London consider that milk can be delivered in good condition without pasteurizing, simply by giving adequate attention to cleanliness."

With regard to sterilization and pasteurization of milk it must be stated that the prevailing idea among medical men is that these processes are undesirable and involve dangers of their own especially to the health of infants and children. Simple and clean milk obtained under proper sanitary conditions is, therefore, preferable to milk thus treated.

The Committee mentioned above also recommends the inspection of the cattle-sheds, milking places, dairy and water supply, and emphatically states that no hospital should be supplied with milk from a farm which has no proper water supply. The reporting of any cases of contagious or infectious disease that may occur in the families of men employed at the farm is also suggested. For the general examination of milk the Gerber fat-tester is recommended, and the use of the creamometer is said to be misleading.

The March number of the *Veterinary Journal*, in the portion assigned to Abstracts and Reports, contains four articles on this and allied subjects, which would amply repay perusal. The one headed "Milk Sediments or Dirty Milk in relation to Disease," which is an abstract of Dr. George Kober's report, is particularly instructive. Milk which yields a visible sediment at the bottom of the bottle after standing for two hours or less should be rejected. This sediment is evidence of dirty habits and is extremely suggestive of danger. It is largely made up of excrementitious matter from the cow, which adhering to the udder of the animal gains access to the bucket during the act of milking. The great danger from milk of this class is the possible presence of ptomaines or toxins which would render it a poison instead of a food. The occurrence of this dangerous sediment can, however, be entirely prevented by clean decent methods without undergoing much extra trouble or expense.

With regard to milk in relation to disease it may be mentioned that not only may it carry contagion from the cow to the consumer as in such diseases as tuberculosis and

foot-and-mouth disease, but milk may acquire infective properties after it leaves the udder of the animal. Numerous instances are pointed out in which sudden outbreaks of typhoid fever, scarlet fever and diptheria have been traced to such infected milk supplied by the same milkman.

Contaminated water and flies often communicate an infective character to milk. Cholera and enteric or typhoid fever have been known to be caused by milk thus polluted. Exposure to infected air may also taint it in this way and render it dangerous.

Infected water may convey the germs when used for washing the utensils or in deliberate adulteration. If there is any reason to doubt the purity of the water used for dairy purposes, it should be boiled. The source of the water should, it is suggested, be at least fifty feet from any possible source of infection.

The following rules mostly taken from a report, in the *Veterinary Journal*, by Dr. E. H. Webster, are of practical local value in this connection :—

1. The cattle shed should be kept clean and the manure should be stored under cover at least 40 feet from it, in a dark place, so as not to attract flies.

2. Clean the entire body of the cow daily. The long hair in the region of the udder should be clipped. Wash the udder and wipe dry with a clean cloth before milking.

3. To clean dairy utensils use pure water only. First rinse them in warm water, then wash inside and out in hot water in which soda has been dissolved. Then rinse again and sterilize with boiling water and keep them inverted in a clean sunny and airy place till they are required for use.

4. The milker should wash his hands with clean water immediately before milking, and should milk with dry hands. He should wear a clean outer garment which should be kept in a clean place when not in use.

5. The milk can should not remain in the cattle shed while being filled. Remove the milk of each cow at once from the shed to a clean room and strain and cool immediately to 50° F.

6. If any part of the milk is unnatural in appearance, or if by accident dirt gets into the milk-pail, the whole milk should be rejected.

7. Persons suffering from any disease, or who have been exposed to a contagious disease, must remain away from the cows and the milk.

8. The shorter the time between the production of milk and its delivery and between delivery and use, the better will be the quality of the milk.

This paper embodies, in a small compass, the views and suggestions of English and American experts of the present day, and the main practical details connected with milk supply and dairy sanitation. For further information the reader is referred to the *Veterinary Journal*. By a curious coincidence, the March numbers of 1906, 1967, and 1908 contain articles on this important subject, all of which afford useful information.

E. T. HOOLE,

Veterinary Surgeon.

HORTICULTURE.

HINTS ON WATERING POT PLANTS.

There is perhaps more art in watering pot plants than in any other phase of their culture, hence it is not surprising that amateurs, and even some professionals, often go astray in this seemingly simple operation. Although hard and fast rules cannot be laid down for the watering of pot plants, the consideration of some of the most dangerous points may perhaps be of profit. At the outset I would impress upon the cultivator the absolute necessity for knowing his plants. By this merely knowing their names is not meant; what is required is a knowledge of their rooting system, their leaf system, the kind of soil in which they are growing, and also the temperature of the atmosphere that surrounds them. We must, above everything else, always keep the fact prominently before us that plants growing in pots, even under the most favourable conditions, are existing under artificial treatment. Armed with an intimate knowledge of his plants, and bearing in mind that they are existing under artificial conditions, the cultivator is well on the road to success in watering them.

Before the plants are put into their pots the careful grower will see that ample drainage is provided by placing broken pots or cinders over the drainage hole. This will go a long way towards the mitigation of over-watering. In applying water always give sufficient to soak the ball of soil from top to bottom, nothing being worse than serving it in driblets. If a plant requires water at all it needs enough to thoroughly soak the whole of the soil in the pot, and to this end enough space should be left when potting to enable sufficient to be given. Many amateurs make the mistake when potting of filling the pots right to their brims with soil.

If a plant has become so dry as to cause the leaves to flag the best course to adopt is to immerse the pot in a bucket or tank of water for an hour or two, because it will be almost impossible to soak the ball of roots and soil by watering it in the usual way, owing to the soil having shrunk away from the sides of pot. The amateur, especially during the dull days of winter, is far more likely to over than to under water his plants, and the former is the most fatal of the two, because its ill effects only reveal themselves gradually. In the winter months, therefore, only give water when there is a likelihood of the plant suffering for the want of it.

Newly-potted plants often suffer much at the hands of a careless or ignorant wielder of the water-pot. After they have had one watering to settle the soil about them great care should be taken not to apply more before it is actually required. Remember that the plant has had a check, and that roots will permeate the new soil much more readily when the latter is moderately moist than they will when it is saturated. If the leaves hang down at all this does not necessarily mean that the soil is dry, but rather that the atmosphere is arid;, and a light syringing overhead under these circumstances will put matters right. The same remarks apply even more forcibly to cuttings. Keep the soil moist, not sodden, if you desire them to root, preventing evaporation of moisture from the leaves and soil by plunging the pots in Coconut fibre refuse and placing a glass case or frame over them.

Many amateurs have an idea that when a plant begins to assume a sickly appearance it needs water, and accordingly supply it in large quantities, never thinking that they are making matters worse. In all probability the mischief was first caused by superfluous moisture in the soil, and the proper course to take will be to examine the drainage hole and see that it is clear, then withhold water until it is quite evident that the plant will suffer if it is kept longer without it. The life of a valuable plant that has become sickly may often be saved by keeping the soil in the pot on the dry side for a time.—*The Garden* 25th April, 1908.

MISCELLANEOUS.

CEYLON AGRICULTURAL SOCIETY.

REPORT FOR 1907-1908.

PRESENTED AT THE GENERAL MEETING OF THE SOCIETY HELD ON 15TH JUNE, 1908.

The last General Meeting was held on the 25th of May, 1907, when a Review of the work done by the Society from its inception in 1904 to the beginning of 1907 was submitted. The present Report refers to its operations since the latter date.

RECONSTITUTION OF THE BOARD.

According to the regulations of the Society, the Board was re-constituted at the beginning of this year for a three years' term of service. Most of the original members remain on it, but the number of provincial representatives has been increased from 38 to 52. The total number of members at present serving on the Board is 102 against 81 previously.

MEMBERSHIP AND SUBSCRIPTION.

In terms of the resolution passed by the Finance and Publication Committees, the subscription for members resident in the Island was raised from Rs. 5 to Rs. 8 per annum, the rate for members residing out of the Island remaining at Rs. 12 per annum. To non-members the Magazine is now available at one rupee per copy, or for an annual subscription of Rs. 10. Only those who have been enrolled as members, however, are entitled to all the privileges of the Society. At date there is a membership of 914.

PUBLICATIONS.

The publication of the English, Sinhalese and Tamil Agricultural Magazines has been carried on without interruption. In August, 1907, the English Magazine proper, edited by Dr. Willis, was augmented by the addition of a Supplement containing from 24 to 32 pages, thus increasing the amount of reading matter to about 100 pages. The Supplement gives greater variety to the contents, and embodies information of special local interest, useful for future reference.

The Sinhalese and Tamil Magazines, edited by the Superintendent of School Gardens and Mr. J. P. Cooke respectively, were issued free of cost to all vernacular-speaking members.

In addition to these periodicals, leaflets were published from time to time, both in English and the Vernaculars, treating of the following subjects :—

- Hints on the Growing of Vegetables.
- West Indian Yams.
- Experiments in Rotations of Crops in Chena Lands.
- Conservation of Soil Moisture.
- Diseases of Tobacco in Dumbara.
- Coconut Stem Disease.
- A Sinhalese Agricultural Calendar.
- Review of the Society's Work 1904 to 1907.

MEETINGS OF THE BOARD.

Nine meetings of the Board were held during the year under review, generally on the first Monday of the month.

The subjects discussed at these meetings included the following :—

- Experiments in Crop Rotations.
- Cultivation of Paddy.
- A Central Agency, to deal with Agricultural Produce from the Provinces.
- Report on a Visit to India by Mr. C. Drieberg.
- An Experiment in the Manuring of Tobacco.
- Roadside Arboriculture.
- A System of Cultivation suitable to Arid Districts.
- The Cultivation of Betel.
- Coconut Stem Disease.
- Suggestions for establishing a rational system of Bee-keeping in the Island.
- The Present Position of the Chief Crops of the Island.
- The Acclimatisation of Plants.
- A Note on Plantain Fibre Machines.
- Experiment with Fodders and Pasture Grasses at Hakgalla and Nuwara Eliya.
- Salt in Agriculture.
- Some Suggestions for the Improvement of Rice Cultivation in Ceylon.
- A Revised Test for Citronella Oil.
- Recent Researches into the cause of Fertility in Soils.

INTRODUCTION OF NEW PRODUCTS.

The importation of seeds and plants was continued during the year. Four good varieties of grafted mango plants (625), three varieties of grafted oranges (750), as well as some Sapodilla grafts were imported from India.

Besides varieties of vegetables, seeds of the following were procured for applicants :—

- Cotton (Sea Island and Egyptian).
- Bellary Onion.
- Durian.
- Indian Betel (cuttings).
- Dry and Wet Paddy.
- Sorghum.
- American Maize.
- Jamaica Yams.
- Kiushu Paddy
- Nepaul Chili.
- Sandal Wood.
- Solid Bamboo.

Senegal Groundnuts.
Bhere Fruit.
Melilotus Officinalis.
Grape Fruit.
Buckwheat.
Arecanuts.

THE CO-OPERATIVE CREDIT SYSTEM.

This system has been the subject of much discussion, and has been taken up by a few branch Societies. The Credit Societies at Telijjawila and Teldeniya, which deal with the supplying of seed paddy, have done good work, and it is expected that Seed Banks will before long become popular and useful local institutions. The attempt made at Baddegama to co-operate for the supply of manure has also proved a success.

EXCHANGE OF SEED.

Experience has proved that the exchange of seed paddy between districts not far removed from one another or of similar character has many advantages. Besides an increase in the yield, cases have been reported of an introduced strain proving less liable to the attack of the paddy-bug and to damage by submersion. The Society is ready to help any one who desires to introduce new strains into his district, by purchase or exchange.

TRANSPLANTING IN PADDY CULTIVATION.

This method of cultivation is being practised more extensively than hitherto. Striking illustrations of its advantages were forthcoming from Hanwella and Welimada. Special prizes have been offered by some of the Branch Societies to encourage the system, which gives promise of becoming more general.

PLANT PESTS AND DISEASES.

Under the Ordinance dealing with Plant Pests, local Provincial Boards have been established, and officers appointed to deal with the stem disease of the coconut palm.

The Society had its attention directed to the following pests :—

Stem, kernel, and leaf disease of the Coconut Palm.
Coconut Beetle.
Paddy Fly.
Betel Vine Disease.
Diseased conditions in the Orange and Cinnamon.

Papers with reference to these and other pests on vegetables were referred to the Government Mycologist and Entomologist for report and advice.

EXPERIMENTAL GARDENS.

The extensive market garden at Ambalangoda, successfully worked for some years by the Wellaboda Pattu (Galle) Branch, has now been planted up with fruit trees. While it lasted it served as an excellent object lesson to the people of the district. Another successful fruit garden is that maintained by the Mudaliyar of Weligam Korale at Telijjawila. In this Korale there is quite a number of vegetable and fruit gardens maintained by individuals under the auspices of the Telijjawila Branch. Vegetable cultivation has also received special encouragement at the hands of the Wellaboda Pattu (Galle) Society, which has instituted a system of annual awards in this connection. The Katunayake Branch (under Mr. A. E. Rajapakse, Mudaliyar) took up the experimental cultivation of various products, and distributed seeds.

More recent gardens are those at Horana, Balangoda and Kegalla. It is desirable that such gardens should be multiplied, though School Gardens are to some extent worked on the same lines.

SCHOOL GARDENS.

It is gratifying to be able to report that School Gardens are serving their purpose admirably, and that the question of still further developing the scheme under which they are worked is under contemplation. According to the latest report by the Superintendent 143 gardens have been established, many of which are models in their way. Last year the Society made a grant of Rs. 212·50 to be awarded as prizes for good work in School Gardens.

AGRI-HORTICULTURAL SHOWS AND FAIRS.

Agri-Horticultural Shows, Market and Cattle Fairs were held at the following centres :—

Badulla (Uva).
Colombo.
Dumbara (Teldeniya).
Kegalla.
Matale.
Matara.
Nuwara Eliya.
Telijjawila
Trincomalie.
Wellaboda Pattu (Galle).
Welimada.

INSPECTION WORK.

The Organising Vice-President and the Secretary made several tours of inspection, holding meetings of Branch Societies and discussing ways and means for furthering the work of the Society in the Provinces. The Northern, Southern, Central, Eastern and Uva Provinces were taken in turn. The advantages of these tours are mutual, enabling the officials of the Society to fully realize the conditions under which agriculture is carried on in the remoter parts of the Island, and at the same time giving the cultivating classes an opportunity of personally conferring with them on various topics which can be best threshed out on the spot.

THE SOCIETY'S MEDALS.

The Society has secured the necessary dies from Messrs. Spink & Son, London, for striking medals to be awarded as special prizes at Agricultural Shows. The design for the medals was decided on by a Special Committee.

APICULTURE,

Bee-keeping has been taken up by an increased number of amateurs, and, it is satisfactory to be able to report, with very promising results. Both European (Italian and Carniolan) and native (*Apis indica*) bees are being kept, and, thanks to the good offices of Mr. Shanks, considerable progress has been made in various directions. By further reducing the size of the hive for the native bee suitable conditions have been provided both for breeding and storing; while the difficulty of inducing this bee to build into an upper chamber has to a great extent been solved. Local honey seasons have also been ascertained with some degree of accuracy, and the discovery of the importance of *Pterocarpus indicus* in the first "honey-flow" of the year is a distinct addition to our practical knowledge. The Bee Committee have been in communication with various experts abroad, and among others with Mr. Morrison, late bee expert in the West Indies, who has afforded much valuable advice.

SERICULTURE.

The rearing of the eri silk worm in villages has been temporarily checked till the Society is in a position to offer more acceptable rates for cocoons, after the expected machinery for disintegrating and washing has had a proper trial. In the meantime all available cocoons have been secured against the arrival of the machines in question which are expected shotrly. A most encouraging feature in the development of this industry is the steady persistency with which some of the teachers in charge of school gardens have carried on silk culture. A notable case in point is the attempt made by the teacher of Mediwaka Government Vernacular School to spin and weave the silk of the eri (*Attacus ricini*) worm. The most recent outcome of his efforts has been the production of silk cloth, woven in the crude hand-loom of the Alutnuwara district, of distinctly good quality and capable of being turned out at a reasonable cost. With the assistance of simple machinery, and the contemplated introduction of a better type of loom, the prospects of a local silk industry are not so remote as they at first appeared. The Silk Farm has suspended work for the present, but Mr. Braine remains in charge, and is taking steps to improve the soil conditions for the growth of mulberry and castor oil plants.

BRANCH SOCIETIES.

At the beginning of 1907 there were 52 branches (including one Indian Association). Regarding these it is unfortunately not possible to furnish a uniformly satisfactory report, since a good many have fallen into a dormant condition, due in most cases to a lack of sympathy in, and encouragement from, the leaders of provincial thought and action. Wherever the chief officials of the district saw their way to indicate their interest in the work of the local branch and to direct its operations, there was a ready response.

One useful purpose which all the branches have served is as distributing agencies for agricultural information, seeds, etc.

The following are deserving of special mention :—*Dumbara Branch.*—Organised a Show, the first ever held in the district, tried artificial manures on tobacco; transplanted and manured paddy; organised seed and money bank; made a trial consignment of produce to Colombo; and experimentally grew a variety of economic crops (cotton &c.).

Nuwara Eliya Branch.—Holds very successful combined Agri-Horticultural, Cattle and Poultry Shows annually; maintains a stud bull.

Telijjawila Branch.—Held two Shows; works a seed and money bank; keeps up two large fruit gardens; has done good work in encouraging the cultivation of fruits and vegetables; tried cattle and poultry breeding but without success.

Wellaboda Pattu (Galle) Branch.—Worked an extensive vegetable garden with good financial results,—now converted into a fruit garden; held two Village Shows; encourages market gardening and transplanting in paddy cultivation by offering prizes; demonstrated that Hatiel paddy brought over from Kandy district stands submersion better than other local varieties; elected to adopt the provisions of the Irrigation Ordinance for the better supervision of paddy cultivation; continues to hold regular meetings.

Wanni-Hatpattu Branch.—Has done much to extend the cultivation of cotton in Chenas, as well as the growing of tobacco; holds periodical meetings; Dikvi paddy which was introduced into the district gave encouraging results and proved immune against the paddy-fly.

Welimada Branch.—Has been the means of encouraging cotton and tobacco growing; organised a Village Show; holds regular meetings.

Jaffna Branch.—Is making efforts to improve the condition of the tobacco Industry; agitated for concessions in the transport of green-manure from the mainland to the Peninsula; introduced improved varieties of

grapes; grants prizes for vegetables offered for sale; is helping to find outside markets for local produce.

Gangaboda Pattu (Galle) Branch.—The most notable work of this branch is the starting of a co-operative agency for the supply of bone manure of guaranteed purity for use in paddy lands.

Badulla Branch.—Has helped to encourage cotton cultivation; organised two good Shows, and is interesting itself in a practical way in extending coconut cultivation in the villages of Uva.

Kurunegala Branch.—Held one large Show and has recently made arrangements to hold a series of Village Shows in different parts of the Province.

Vavuniya Branch.—Initiated practical co-operative measures for the transport of cattle and Agricultural produce to Colombo; keeps up an experimental garden.

Katunayake Branch.—Started an experimental garden and does good work through seed-distribution, encouraging School Gardens, and placing vernacular agricultural literature within the reach of the masses.

AGRICULTURAL INSTRUCTORS.

Up to date only two officers have been employed, both for service in the Sinhalese districts. [The appointment of an Instructor for the Tamil Districts is just about to be made.] These men are now working according to an organised plan, taking up province by province and dealing with each division in detail.

A proposal is under consideration for providing a longer and fuller course of training for those who are to be employed as instructors.

STOCK INSPECTORS.

These officers are under the direct control of the Government Veterinary Surgeon. Their regular work is of a Veterinary nature, but under a scheme sanctioned by Government their services are also available, when necessary, for agricultural inspection and instruction in the provinces in which they are stationed. For a training in this work they are, in turn, sent for a term to the Experimental Station, Peradeniya, and the Government Stock Garden, Colombo.

AGRICULTURAL EDUCATION.

At present there is no provision for Agricultural Education in Schools, but the elementary facts of agricultural science are illustrated by means of object lessons on plant life that are given at most Government Schools.

A Special Committee, now sitting, is dealing with the question of introducing a regular system of Nature Teaching into the lower standards of Government Vernacular Schools, and of including an Agricultural Reader in the syllabus of the higher standards—both subjects to be taught in as practical a manner as possible through the medium of School Gardens.

Altogether there would appear to be a tendency to give to rural education that practical turn which it so much lacks at present.

TOBACCO INDUSTRY.

A good deal of discussion has lately taken place regarding the possibility of improving the position of the local tobacco industry which —particularly in the Jaffna district—is in a depressed condition. The Government Agent of the Nothern Province has reviewed the situation in an instructive memorandum, the Jaffna public appointed a Committee to advise how matters could be mended, while this Society has delegated a Committee of its own to consider what steps, if any, it should take to improve the industry.

The main questions involved would appear to be:—(1) Whether the local varieties of tobacco, cultivated as they are, will lend themselves to improved methods of curing with a view to the production of better tobacco than is required for the manufacture of native ("Jaffna") cigars. (2) Whether local varieties can be improved by a better system of cultivation and manuring, and thus be made to yield a finer leaf (less coarse) likely to produce a superior tobacco when properly cured. (3) Whether the natural conditions of soil and climate would render it possible for the best introduced varieties of tobacco to be successfully cultivated in the Island. (4) Whether it would not be wise to restrict the tobacco area in the North, and apply part of the land to other forms of cultivation likely to yield better financial returns. It would be necessary for the tobacco cultivators to co-operate with Government in applying the necessary tests for the solution of these problems. To adopt a *non possumus* attitude and look to the State for relief is unworthy of an admittedly industrious, provident and enterprising community. The recommendations of the Society's Committee are being awaited.

NOXIOUS WEEDS.

A good deal of correspondence regarding the extermination of illuk (*Imperata arundinacea*) and Prickly Pear (*Opuntia dillenii*) has come before the Board, and its recommendations (which are given in the pages of the Magazine) have been adopted in many cases with satisfactory results.

STERILIZATION OF MILK.

In connection with the proposed removal of the Government Dairy from its present site, the question of the sterilizing milk and sending it down by rail from a distance of 35 to 75 miles from Colombo, was referred to

a Committee of the Society. This Committee has reported that, although it has proved possible to sterilize small quantities of milk, it would not be advisable to attempt the treatment on a large scale unless the services of a Dairy Expert, thoroughly conversant with the practical working of a sterilizing plant, were secured.

FIBRE MACHINERY.

The Board has indented for a set of the Duchemin fibre machines for testing their capacity to deal with plantain fibre, and native fibres which it might be found possible to economically extract and place on the market.

LIVE STOCK.

Considerable work has been done in the direction of regulating the breeding of improved stock by emasculating undesirable males in village herds. According to a report prepared by the Government Veterinary Surgeon, in 1907 the castration of bulls was carried out at 56 centres, 781 head of cattle were operated on and 41 hands instructed in the work. In addition 479 head were operated on by the trained hands. Between January and June of this year, 135 cattle were operated on, and three men trained.

THE STAFF.

The executive and clerical staff remains the same, though the volume of work has increased considerably, viz :—

Organising Vice-President—Dr. J. C. Willis, D. Sc.; Secretary—Mr. C. Drieberg, B.A., F.H.A.S.; Head Clerk—J. S. de Silva; Assistant Clerk—W. A. W. Gunawardena; Personal Clerk to Organising Vice-President —A. F. Baldesing; Agricultural Instructors Messrs, N. Wickremeratne and L. A. D. Silva.

WORKERS FOR THE SOCIETY.

Among those who have rendered notable service in the Society's cause are :—Mr. Wm. Dunuwille, Dissawe; the Mudaliyars of Wellaboda (Galle) Pattu and Weligama Korale; Mr. A. E. Rajapakse, Mudaliyar of Katunayake; Mr. C. Rasanayagam, Mudaliyar of Panwila; Mr. M. Suppramaniam, Broker of Colombo; and the teachers of the Government Vernacular Schools at Nugawella, Welimada and Akurala. Of the Schoolmasters, who, through their connection with School Gardens, are rendering similar good service, I would specially mention the present teachers of the Government Schools at Mugurugampola, Handapangoda and Kirriwathuduwa (in Western Province); Nugawala, Mediwaka and Alawatugoda (in the Central Province); Welimada (in the Uva Province); Gandara and Narandeniya (in the Southern Province); Makandura (in the North-Western Province); and Ratmalagahawewe (in the North-Central Province).

THE POSITION OF THE SOCIETY: A SUGGESTION.

That the Society has aroused a healthy interest in all questions relating to Agriculture, and evoked a spirit of enquiry in all sections of the agricultural population —in the peasant as in the landlord—cannot be gainsaid. I have had ample evidence of this afforded me both as Secretary of the Society and as Superintendent of School Gardens, and I have no doubt that the Organising Vice-President has also had opportunities for noticing the same attitude of mind in those with whom he came in contact during his tours in the Provinces.

Looking upon the Society as an organisation which serves as a medium between individuals and those agencies which are able to meet their wants—whether information, advice, or material—its position is an important one; and the system of communication that it has set up, extending far beyond the Island, is proving a most useful means of serving the agricultural interests of the Colony.

For more direct and effective work among our village population it is much to be desired (1) that an Executive Board should be formed with Provincial Boards over which the Revenue Officers should preside, and the operations of which they should control with the advice of the Central Board; (2) That a larger staff of trained Agricultural Instructors should be appointed to carry on systematic work, according to an approved plan, under the Revenue Officers.

ACKNOWLEDGMENTS.

To Government the Society is indebted for the financial help it affords; to His Excellency the Governor for the interest which, as President, he has evinced in its work for the reforms which His Excellency has effected in its administration, and for his desire to further improve the status and extend the scope of the Society to the members of the Board, both official and unofficial, for their co-operation; to those who have rendered willing service by contributing papers at the monthly meetings, and by helping in a more practical way to further the objects of the Society.

C. DRIEBERG,

Secretary, Ceylon Agricultural Society.

Office of the Ceylon Agricultural Society, Colombo, 15th June, 1908.

"SOME BEAUTIFUL TROPICAL TREES AND THEIR USES."

BY H. F. MACMILLAN.

The selection of this subject I owe chiefly to the Hon'ble Mr. Ferguson, who has been lately collecting information about flowering trees in the neighbourhood of Colombo. I have for the present included under the above heading only fine flowering trees, not however that there are not many trees which are also very handsome on account of their foliage; but these might well form the subject of another paper. The former may be distinguished by the convenient term Flowering Trees, which does not of course apply in a botanical sense, since all trees normally produce flowers, whether these are showy or inconspicuous. Many flowering trees of the tropics are of surpassing beauty and magnificence, and the more they are seen and the larger their number together, the greater do their beauty appeal to one. They have with few exceptions no counterparts in temperate countries, unless they might by a stretch of the imagination be considered as greatly magnified forms of the more showy annuals and perennials which so effectively adorn gardens and parks in cooler climes.

Apart from æsthetic purposes, however, flowering trees in the tropics have an important utilitarian value. They combine in many instances the qualities of shade and ornament, and afford a grateful shelter from the tropical sun to man and beast; they cool the temperature appreciably, they are soothing to the eye, and they possibly ease the mind when perspiration wrings our brow. A poet from under the shade of the Flamboyant tree has said:—

"We think not of the land
"Parched swooning, under cloudless burning sky,
"But silent, gaze entranced on beauty rare."

It is admitted that trees in towns have a valuable hygienic effect. One authority goes so far as to assert that the atmosphere in the neighbourhood of trees should be healthy as mountain air. In a certain district in France it has been computed that the average life of man has been prolonged by four years owing to the planting of trees. Local Municipal authorities and road engineers are divided on the question of the utility of trees in thoroughfares. Whilst, however, all admit the great benefit of their shade to comfort and even health, many contend that this is outweighed by the damage they do to roads and buildings. But the best replies to this argument are: What are the kinds of trees selected? How have they been planted? What attention has been given them in their young state in order that they might gro up as healthy sturdy trees? Who looks after their requirements afterwards, maintaining their even balance and preventing serious injury being done to their bark, roots, or foliage? Let those who are responsible answer these questions.

Personally I would urge the advisability of planting choice and suitable trees wherever practicable. In England as well as in other temperate countries, every town has now its avenues of trees, and every municipality of importance has a special department for the care and management of such trees.

Many different kinds of trees may already be seen in and about Colombo, but generally speaking they are planted without due regard to order, and seem to have a neglected appearance. But presumably nobody in particular is responsible. A striking exception is Chatham Street in Colombo, which is planted with the beautiful and shady ***Peltophorum ferrugineum*** tree. Who would not appreciate more thoroughfares planted after this style? There are many other equally desirable trees, sufficient perhaps to plant up every leading thoroughfare in Colombo with a different species. To add to their charm, too, I think that the name of the tree so planted might be given to the street or avenue. For example, Peltophorum Street would sound more classical than Chatham Street; or, Amherstia Avenue than Slave Island Road; Cassia Terrace than Jail Road; and Spathodea Grove than Paranawadiya Lane, and so on. There seems no valid reason why Colombo and other towns should not thus become in course of time as noted for their floral avenues and parks, as French towns are famous for their beautiful boulevards of foliage trees.

But the planting of beautiful trees need not be confined to towns, public parks, and recreation grounds. The depressing effect of the long unbroken stretches of rubber trees in the Straits is a common complaint, and rubber planters not infrequently long as much for a change of landscape as for a change of climate. One of the leading owners of rubber property in the Straits has lately confirmed this view in conversation with the writer. A relief from the monotony of interminable flats of rubber trees would be afforded by planting up at least boundary lines, wind-belts, &c., with bright flowering trees. The same idea is equally applicable in Ceylon, on Tea as well as Rubber plantations, and I consider that as much consideration should be given to the quality of the trees planted immediately around the Superintendent's bungalow for ornament, as to those of the rest of the property for economic purposes. Further, it is well-known that the intermixture of trees as far as practicable is a wise precaution against disease and insect pests.

Although poets tell us that all trees are beautiful, all do not equally answer the purpose of ornament. In fact it is seldom that any fulfil our requirements satisfactorily without certain artificial attention. But it should be a maxim that if a tree is worth planting, it is worth looking after. Two important considerations necessary to remember are: (1) the selection of trees suitable to the place or purpose for which they are required, and (2) the necessity of planting them in a systematic manner, and afterwards attending to their requirements in the way of shade, support, protection from cattle, pruning, &c. Trees like children need careful attention when young, and should be trained to grow up in a useful and practical way. Otherwise no tree will fulfil its function to the best advantage, and its life will probably be unsatisfactory and short. I have recently had the unpleasant duty, with a Public Works official, of condemning to death a large number of trees in a public thoroughfare which had been neglected and had therefore become dangerous to neighbouring houses.

The following are some of the most beautiful flowering trees of the tropics, given in alphabetical order. By coincidence the first on the list is perhaps the finest flowering tree in the world, viz. :—

S after the common name means Sinhalese *T*=Tamil.

Amherstia nobilis (Leguminosæ)—named in honour of Lady Amherst. A medium-sized tree, native of Burma, and considered the most beautiful of all flowering trees. Its immense candelabrum-like sprays of red and yellow flowers, drooping from every branch of the tree among the handsome foliage, present an appearance of astonishing elegance and loveliness. It is in flower during the greater part of the year, but its chief flowering season is January to March. The tree thrives in the moist low-country up to 1,600 feet, and requires good rich and well-drained soil. It does not seem to flourish near the sea, and I believe is seldom met with about Colombo. Introduced to Ceylon in 1860.

Bauhinia triandra (Leguminosæ)—"Mountain Ebony."—A small tree with very showy large flowers, borne in racemes, pink merging into purple. Each of the leaves is composed of two leaflets joined at the base; hence the genus takes its name from Bauhin, twin brothers and botanists.

Brownea ariza (Leguminosæ).—A small spreading tree with pinnate drooping foliage, native of Tropical America, and introduced to Ceylon in 1884. It bears from the ends of the branches large clusters of blossom which weigh the branches down. The flowers are of a deep rose colour, of great beauty, resembling large Rhododendron flowers.

Brownea coccinea (Scarlet).—A short spreading tree, native of South America and introduced to Ceylon in 1849. It is distinguished from the other Browneas by the small but numerous clusters of scarlet flowers produced on the stem and older branches.

Brownea grandiceps (Large-headed).—A larger and handsomer tree than either of the former two, native of Venezuela, introduced into Ceylon in 1870. A very beautiful tree when in blossom, the flowers being borne in very large heads at the ends of the branches, bright red in colour. The foliage too is very handsome. The young leaves are produced in long, drooping bunches; similar to those of Amherstia.

Brownea macrophylla (Large-leaved).—A strong growing species, introduced in 1894. It is of a less free-flowering habit than those already named, but the flowers are the largest, and are of a pleasing shade of rose-colour; the long coloured stamens also distinguish the flowers from those of the other species of Brownea.

Butea frondosa (Leguminosæ).—"Bengal kino-tree." "Gas-kela," S., "Parasu," T. An erect tree with trifoliate leaves, indigenous to the forests of the dry region of India, Ceylon, and Burma; reaches a height of about 40 feet, and bears in the dry months a profusion of orange-scarlet flowers. The tree furnishes a resin ("Kino") and a useful fibre; a lac is produced on the young twigs, and the flowers are used in India for dyeing yellow and orange-red.

Cassia Fistula (Leguminosæ).—"Indian laburnum"; Pudding-pipe; "Ehela," S., "Tirukkontontai," T. A small upright tree, common in the forests of the dry region of Ceylon and India. A beautiful object when in blossom, the flowers being bright yellow, borne in numerous long pendulous racemes. The flowers are used in temple ceremonies, and the astringent bark for tanning and in native medicine. The black cylindrical pods grow from 20 to 30 inches in length; the pulp of these is a well-known purgative. Suited chiefly to the rather dry country, but with good drainage will thrive in the moist districts up to 2,000 feet.

Cassia grandis (Great).—"Horse Cassia." A native of South America growing to a height of 40 to 50 feet; bears a profusion of pink inflorescence during the dry months of February and March, when the tree is completely deciduous. The thick, curved pods, the pulp of which has an offensive smell, are produced in abundance in June.

Cassia marginata (Marginated leaf).—"Ratu-wa," S., "Vakai," T. A small graceful tree with spreading drooping branches, common in the dry region of Ceylon and also in South India; very ornamental when bearing its racemes of rose-coloured flowers, produced in July and August.

Cassia multijuga (Many-yoked).—A slender quick-growing tree of Tropical America, introduced to Peradeniya in 1851. Remarkably beautiful when in full flower during August and September, being practically smothered with very large racemes of bright yellow flowers, suggesting a magnified Calceolaria. The tree luxuriates in the moist climate of Peradeniya, but does not produce seed here. At Anuradhapura, however, in the drier region, it bears fruit.

Cassia nodosa (knotted, referring to the knotted stems).—A moderate-sized tree, native of Eastern Bengal and Malaya, very beautiful when bearing its profusion of bright pink and rose-scented flowers, during April and May. The flowers are followed by cylindrical pods, 12 to 15 inches long. The tree is deciduous in the dry weather.

Cochlospermum gossypium (Bixaceæ).—"Kinihiriya" or "Ela-imbul," S., "Kongu," T. A rather small tree, native of Central India. It has become semi-naturalised in dry districts in Ceylon, and is often found planted near Buddhist Temples. A beautiful tree when in blossom, during February or March, with its large bright yellow flowers, which are esteemed as temple offerings. The tree is deciduous in the dry weather; thrives in either dry or moderately wet districts below 2,000 feet.

Colvillea racemosa (Leguminosæ)—named in honour of Sir Charles Colville when Governor of Mauritius. A medium-sized tree (30 to 40 feet high) with handsome pinnate leaves, native of Mauritius and Madagascar. It bears in September large, erect close racemes of bright scarlet flowers, presenting a very showy appearance. Suited to the moist or moderately dry low-country.

Gliricidia maculata (Leguminosæ).—"Madré." A small quick-growing elegant tree introduced from the West Indies about 1889. It bears long arching feathery leafy branches, which in the dry weather drop nearly all their leaves and produce along the greater part of their length masses of pinkish purple flowers, making the tree a striking object for a time. It thrives up to 2,000 feet, and may be seen flourishing in the Victoria Park and elsewhere about Colombo. Its quick growth and light feathery habit recommend it as an excellent shade and green manure tree. It belongs to the nitrogenous class of Leguminosæ; also forms good support for vanilla vines. The introduction of this into Ceylon was effected by Mr. C. Drieberg when Superintendent of the Agricultural School.

Jacaranda mimosæfolia (Bignoniaceæ)—A very elegent tree both on account of its leaves and flowers. It reaches a height of 40 to 50 feet, and bears a profusion of blue bell-shaped flowers all along the older wood of the branches. Flowering seasons, February to May, and August to September. The elegant bi-pinnate mimosa-like leaves make the tree well worth growing as small foliage plants for pots in verandahs.

Kleinhovia hospita (Sterculiaceæ).—A large handsome Malayan tree, introduced to Ceylon about 1820; it bears large terminal panicles of pink or rose-coloured flowers, which appear during July and August. Thrives in the moist low-country.

Lagerstrœmia flos-reginæ (Lythraceæ).—"Pride of India"; "Murutu," S. A tree of extraordinary beauty, about 50 to 60 feet in height, native of Ceylon, India, and Malaya. It is undoubtedly one of the most strikingly showy of flowering trees. It is deciduous for a short time in the dry weather, but from April to July or later it bears from the ends of the branches huge panicles of large mauve or pink flowers. There are two or more varieties, with the flowers varying from shades of mauve to a lovely bright pink.

Lagerstrœmia tomentosa (Lythraceæ).—A moderate-sized handsome tree, native of hot and moist parts of Burma, introduced at Peradeniya in 1891. It blossoms twice a year, April and October, bearing large erect panicles of lovely white flowers, produced from the end of every branch. A very ornamental tree when in blossom.

Lysidice rhodostegia (Leguminosæ).—A large handsome tree, native of Southern China, introduced at Peradeniya in 1882. It thrives here and bears from December to February masses of pink or rose-coloured inflorescence, produced at the extremities of the branches. The persistent coloured calyces render the tree very showy for several weeks. A handsome tree when in flower.

Mesua ferra (Guttiferæ)—"Iron-wood"; "Na-gaha," S., "Naka," T.—A moderate-sized, broadly conical, slow-growing tree, native of the hot and moist regions in Ceylon, India and Malaya. A very handsome tree, much in favour, for planting near Buddhist temples. It blossoms profusely in the months of April or May, the large white flowers with yellow stamens, being delicately scented. The young leaves, which appear twice a year, are of an intense blood-red colour, passing through delicate shades of pink into the dark green of the adult growth.

Millingtonia hortensis (Bignoniaceæ).—"Indian Cork-tree." An erect tree with deep-green finely divided foliage, reaching a height of fifty feet or more; bears in November and June a profusion of long, pure white, fragrant flowers. The tree is a favourite in Indian gardens; thrives up to 2,000 feet in Ceylon.

Oncoba spinosa (Bixaceæ).—A small bushy tree of Arabia, with light green, small ovate leaves. It bears in April from the underside

Photo by H. F. Macmillan.

JACARANDA MIMOSÆFOLIA:
A BEAUTIFUL FLOWERING AND FOLIAGE TREE.

Photo by H. F. Macmillan.

MESUA FERREA. IRON-WOOD TREE; "NAGAHA," S.

of the young branches large single white flowers with yellow stamens, very delicately scented and suggesting in appearance wild dog-roses of a large size. Introduced at Peradeniya in 1883. It has not yet set fruit.

Peltophorum ferrugineum (Leguminosæ).—"Iya-vaki," T.—A very large quick-growing, symmetrical tree, with a spreading top and very graceful fine foliage, indigenous to Ceylon and Malaya. The young leaves and shoots are covered with a brown velvet tomentum, from which the tree takes its specific name. It flowers twice a year, but during different months, being remarkable for the fact that when one tree is in flower, another (of the same kind) side by side may be in fruit, another may be deciduous; the flowers are rusty yellow, sweet-scented, and borne in large erect panicles. Dr. Trimen states:—"It is a magnificent sight when in full blossom." It is suited to the dry region, but also thrives to perfection in the moist region up to 1,800 feet elevation.

Plumeria acutifolia (Apocynaceæ).—"Temple tree"; "Pagoda tree"; sometimes called "Frangi-pani." "Everiya" or "Araliya," S.—A low, spreading, succulent tree or shrub, introduced from Tropical America and now naturalised in Ceylon, India, &c. It is a familiar tree in the Eastern tropics at low elevations, and in the low-country of Ceylon generally, especially near temples. It is bare of leaves throughout the dry weather, when it bears large corymbs of white and highly fragrant flowers.

Plumeria rubra (Red).—A tree similar to the latter, but of a less spreading habit, bearing bright crimson flowers. Very showy.

Poinciana regia (Leguminosæ).—"Flamboyante"; "Flame tree"; "Gold Mohur."—A gorgeous tree when in full flower, bearing during the months of March to May immense panicles of scarlet or orange and yellow flowers. It is a very striking object in and about Colombo at this time of year. The tree grows from 50 to 60 feet in height, and has handsome fine feathery leaves.

Posoqueria longiflora (Rubiaceæ).—A moderate-sized, quick growing tree, with large deep-green leaves, native of Tropical America. It produces long tubular white and sweet-scented flowers, borne in pendulous clusters, during May and September. Suited to moist districts up to 2,000 feet.

Pterocarpus echinatus (Leguminosæ).—A moderate-sized spreading tree, native of the Philippines, introduced at Peradeniya in 1882; bears large racemes of pale yellow flowers at the ends of the branches during April and May. Very ornamental when in blossom. Suited to the low-country.

Saraca declinata (Leguminosæ).—A small tree, native of Sumatra, introduced at Peradeniya in 1870. It forms a beautiful sight when bearing its huge heads of bright orange yellow flowers, produced on the stems and older branches during February and March. Thrives best in partial shade in the moist low-country.

Saraca indica (Indian).—"Diya-ratmal" or "Diya-ratambala," S. "Asoca Britsch," Hind.—A small spreading tree, native of Ceylon and South India. On the stems and branches are produced in January to March large sessile clusters of sweet-scented flowers, which change from yellow to orange and red. The young leaves are pendulous as in Brownea and Amherstia. Thrives in shady situations, especially near water, in the wet or semi-dry districts below 1,800 feet.

Schizolobium excelsum (Leguminosæ).—A very large quick-growing tree, with fine bi-pinnate feathery leaves, native of Brazil. Introduced in 1872 at Peradeniya, where it luxuriates, blossoming and producing fruits regularly. The flowers are borne in enormous erect racemes, of a bright yellow colour, during February and March, when the tree is quite bare of leaves. The flowers are at once followed by beautiful feathery young foliage. Thrives up to 1,500 feet in the moist region.

Solanium macranthum (Solanaceæ).—"Potato tree." A medium-sized, quick-growing and soft-wooded tree of Brazil, reaching a height of 30 to 50 feet, introduced to Ceylon in 1844. It is a handsome object on account of its very large and rather spiny leaves, but is particularly ornamental when in full blossom. The large blue and white flowers, with conspicuous yellow anthers, are produced at most seasons of the year, but more especially after the dry weather. Thrives best in particularly shaded situations at elevations below 3,000 feet. This is the only species of the potato order that grows into a tree form.

Spathodea campanulala (Bignoniaceæ).—A tall erect tree from Western Tropical Africa, introduced into Ceylon in 1873, and now fairly commonly planted about Kandy and elsewhere as an ornamental shade tree. Its large bright orange-red, erect flowers, produced at the tips of the branches throughout the wet season, render it strikingly handsome and conspicuous at a distance. The unexpanded flowers contain a quantity of water, hence the tree has been christened the "Fountain-tree." Thrives up to 1,600 feet.

Sterculia colorata (Sterculiaceæ).—"Malarparutti," T.—A moderate-sized tree of 40 to 50 feet in height, indigenous to the dry region of Ceylon but thrives also in the moist districts. The brilliant orange scarlet flowers, appearing in great profusion when the tree is leafless (February to March at Peradeniya), render the tree a handsome and

conspicuous ornament. The Veddas (aboriginals of Ceylon) are said to call the tree "Kenawila," and sing odes to it.

Stereospermum xylocarpum (Bignoniaceæ).—"Padri tree" of India. A large spreading tree, native of South India, deciduous for a short time in the dry weather. It bears for a week or two a profusion of white bell-shaped flowers. Thrives up to 1,500 feet.

Tabebuia spectabilis (Bignoniaceæ).—A small tree of Venezuela and the West Indies, introduced at Peradeniya in 1881. For a short period in April or beginning of May, when bear of leaves, the tree is an exceedingly beautiful sight, being literally covered with masses of yellow flowers, which as they drop from a goldən carpet on the ground. Thrives at Peradeniya (1,500 feet), but as yet only rarely produces seed here.

LUTHER BURBANK.

(New Creations in Plant Life, an authoritative account of the life and work of Luther Burbank. By W. S. Harwood, 2nd Ed., New York, the Macmillan Company, 1907.)

In a recent contribution to the *Tropical Agriculturist*, the writer of this review had occasion to divide the history of cultivated plants into four stages. The last of these stages was initiated very recently by the application of definite scientific knowledge to the improvement of plants, a process of which the results lie largely in the future. The last stage but one was described as the epoch of the professional non-scientific breeders, who have advanced the value and beauty of cultivated plants to the condition in which we now see them in the horticultural and agricultural shows of Europe and America.

Luther Burbank may perhaps be regarded as the culminating figure of the pre-scientific epoch; though it is somewhat difficult to gauge directly his exact position, because so few of his productions have gained a footing outside America, whilst the proportion of those which are found to flourish outside his native state of California is comparatively small. An idea of the estimation in which his work is held by people in his own country who are competent to judge may, however, be obtained from the fact that in 1905 the trustees of the Carnegie Institution of Washington voted a grant of ten thousand dollars a year for ten years for the purpose of enabling Mr. Burbank to carry on his work without wasting energy over petty details of business. Burbank has thus become a national institution, and this circumstance may possibly be regarded as some excuse for the strain of blatant journalistic patriotism in which Mr. Harwood writes about him.

If we penetrate the halo of eloquence in which Mr. Harwood enshrines his idol, a certain amount of interesting and useful information may be extracted from the pages of this book, though it need scarcely be said that a good deal of caution is required in accepting some of the statements which occur. Some of the most surprising of these are, it is to be hoped, only errors of haste and want of revision. Thus most readers will be aware that a walnut tree does not obtain its nitrogen direct from the atmosphere (p. 62), and that poppies do not produce seeds without flowers.

The most notable of Mr. Burbank's new productions are to be found among fruit trees and especially among plums. The methods of improvement which he has employed consist in crossing, followed by selection on a very extended scale. These processes contain nothing which is either mysterious or miraculous. What is remarkable is the fact that Burbank, so we gather, selects his plants for fruiting qualities whilst they are still young seedlings and before any fruits have been actually produced by them. The testimony that he has made a success of this method appears to be conclusive, and such success can only have been arrived at by powers of intuition and experience of a highly remarkable order. We take leave to reserve our judgment, however, as to the accuracy of the statement that when the test was made of growing a number of the rejected seedlings, as well as of the chosen, to the fruiting stage, the former were of inferior and *all* the latter of superior quality.

Among fruit trees Burbank has essayed the production of a number of complete novelties by the crossing together of totally distinct species. Many of these crosses were entirely sterile, as indeed was only to be expected, whilst some of those which fruited can be regarded as little more than curiosities. Crosses between the plum and the apricot, and between the Californian dewberry and the raspberry are said to have given rise to new fruits of considerable value; though young specimens of the plum-cot, as the former of these novelties is called, seen by the writer of this review at an English nurseryman's last year, seemed to show that this particular creation does not take very kindly to a new country.

Comparable with the last named fruit is the pomato, the result of a cross between the tomato and the potatoe—and we may note in passing that the improvement of the potatoe was among the first of Burbank's successes. On the other hand crosses between the blackberry and the apple, and between the raspberry and the strawberry could hardly be expected to give rise to stable new types, and as a matter of fact neither of these hybrids ever fruited.

Among other notable successes have been hybrid walnuts—trees of extraordinarily rapid growth and yielding valuable timber; the pineapple quince, so called from the novel flavour; and the thornless cactus for which a great future is foretold from the point of view of stock-feeding in desert regions, Besides these a great number of garden flowers might be alluded to such as Cannas, Poppies, Amaryllis and the Shasta daisy.

So far we have recorded the successes of a remarkable natural genius in his own line of work, and if we seem to have given them a somewhat grudging recognition, it is because we have sought in simple statement an antidote to the rapturous phrases of the work under review. In Mr. Burbank's manifold new productions, in his notable success as a gardener and plant breeder, we have evidence of very marked powers of patience and industry and of other powers which can only be described as amounting to an instinctive knowledge of plants, borne no doubt principally of a vast experience. This equipment does not however entitle Mr. Burbank to deliver judgment on scientific problems. In point of fact neither he nor his biographer has any understanding at all of the meaning of scientific work, and Mr. Harwood, at least, shows himself quite incapable of stating a simple scientific problem intelligibly. This is a circumstance over which no one need distress himself were it not for the announcement in the preface that "the statements in this volume, both those which have a scientific, and those which have a practical bearing, stand unreservedly vouched for by Mr. Burbank." We find it difficult to believe that Mr. Burbank is capable of the muddled ideas with which his interpreter credits him, and we earnestly recommend Mr. Harwood to omit the chapter entitled "Theories and Conclusions" from future editions of a work which, as a piece of purely rhapsodic writing, has certain peculiar merits of its own. If time had been available we should have liked to estimate the number of times the words miracle and miraculous are made use of by our author.

R. H. LOCK.

SUGGESTIONS ON RURAL EDUCATION.

With the object of assisting in some degree the adoption of rural education to the conditions of rural life, specimen courses of special object lessons and of gardening were published by the Board of Education in 1901 and 1902. These pamphlets have long been out of print, and the Board of Education have now issued a phamphlet by Mr. T. S. Dymond, entitled "Suggestions on Rural Education," in which an attempt is made to set out the educational needs of those who are to follow rural pursuits, to suggest the character of the instruction that would supply the educational equipment required to meet those needs, and to indicate the means by which in course of time such instruction could more generally and more adequately be supplied.

Rural prosperity, Mr. Dymond observes, primarily depends on the prosperity of rural industry, and this, though principally determined by economic conditions, must also depend upon the intelligence, adaptability, knowledge and skill of those engaged in it. The prosperity also of rural workers depends on the profitable use made of cottage gardens, allotments and small holdings by the men, and the domestic skill of the women. It must also be remembered that, in the country, people must depend for recreation on their own mental and physical resources, so that general culture has an important part to play in making country life attractive; and lastly, that the natural increase in the population usually necessitates a steady migration of young men and women from the country to the town, and education must be of such a kind as not to place these at a disadvantage.

Elementary Schools.—It is principally to the development of intelligence and observation in connection with rural subjects that the system of elementary education should be directed. The influence of country surroundings should be distinctly felt, and the subjects should be taught more in relation to the rural environment of the school. Mr. Dymond lays great stress on the value of nature study, gardening and other manual work in elementary schools, as well as the treatment of other subjects, such as drawing, geography, arithmetic, &c., in relation to rural life.

Higher Elementary Schools.—Higher elementary schools and upper classes are intended to carry on the work of the elementary school and develop it in the direction of the industries the scholars are likely to follow. For this purposed Mr. Dymond suggests that nature-study should give place to the study of natural science and to the application of science to agriculture, horticulture, dairying, domestic economy and hygiene. The subjects of manual instruction should be developed in their industrial aspects; thus food culture would form an important subject for practical work, and needlework would be carried on to dressmaking. Arithmetic should be developed in the direction of mensuration and mechanics, and be correlated with book-keeping and commercial correspondence. The subject of general culture would include a secondary course of English literature, history and geography, together with singing and physical exercises.

Rural Seconday Schools.—The function of the rural secondary school is to instil that general culture which gives an outlook wide enough to encompass all rural activity and that knowledge of science underlying rural

economy which is necessary rationally to direct rural enterprise. While the elementary schools are essentially intended to prepare pupils for occupations involving manual work, it is the development of mental activities at which the secondary school will predominantly aim. Manual work, therefore, takes a subordinate place in the secondary school, and is introduced rather to afford a balance in educating powers of mind and body and to provide means for illustrating mathematics and the sciences.

In the elementary school a foundation of nature-study will have been laid upon which the study of science can be built. In the rural secondary school, it is suggested that chemistry and physics should be dealt with as branches of natural science—that is to say, a knowledge of experimental science should be built up by a progressive practical study of air, of water, mineral substances, of the products of animal and vegetable life, those reactions and substances being used a knowledge of which is important in rural industry.

Mathematics should be correlated with (*a*) practical surveying in the field, (*b*) woodwork from scale drawings, which might be chiefly devoted to making the apparatus and appliances required in the science work indoors and out, and (*c*) mechanics, which should be illustrated by reference to the construction of farm implements and buildings. Book-keeping and correspondence would advantageously deal with the ingoings and outgoings of the experimental field, the orders for manures, tools, seeds and sale of produce. Geography, history, literature, a foreign language and drill will complete the curriculum. Such a course should be graded to the capacity of boys of 12 to 15 or 16 years old, for at 15 or at least 16 the boys who are to follow rural pursuits will usually begin business life.

Higher Agricultural Education.—The boy who shows such ability as to give promise of a successful career in agricultural science may wisely also leave the secondary school at 16. The next two years may profitably be spent as pupil upon a farm, provided that each winter the pupil attends an agricultural short course, and it is after this that he will enter the agricultural college or university department with the greatest profit. Or again, in lieu of the two years' pupilage on a farm, a year or two years may be spent at a school or schools of rural industry. No country can be held to have a properly organised scheme of agricultural education which does not provide scholarships to enable promising boys with an agricultural bent to mount the educational ladder from the rural elementary school to the agricultural department of a university.—*Journal of the Board of Agricultue*, March, 1908, Vol. XIV., No. 12.

CEYLON AGRICULTURAL SOCIETY.

The Annual General Meeting of the Ceylon Agricultural Society was held at noon on Monday, 15th May, in the Council Chamber. H. E. the Governor presided, and the others present were :—Sir S. D. Bandaranayaka, Dr. J. C. Willis, Hon. Mr. J. Ferguson, Hon. Mr. F. C. Loos, Hon. Mr. S. C. Obeysekere, Hon. Mr. A. Kanagasbai, Messrs. A. H. Thomas, Dr. Ludovici, R. H. Lock, M. Kelway Bamber, G. W. Sturgess, J. Harward, E. Cowan, P. Arunachalam, W. Dunuwila, L. W. A. De Soysa, F. L. Daniel, F. M. Mackwood, W. D. Baldwin, M. Suppramanian, Rev. P. T. Cash, Dr. H. M. Fernando, Capt. J. Curling, Mudaliar A. E. Rajapakse, Messrs. T. Cockerill, Jas. Gibson, H. J. Pieris, A. N. Galbraith W. S. D. Tudhope, &c.

After the Secretary had read the minutes, His Excellency said: The first item on the Agenda is the presentation of the Secretary's Report. I understand that the Report has been circulated and has been in the hands of members for several days, and it will therefore be taken as read. But before adopting the Report, I should like members to make any remarks that they may have to make upon the Report in general or any item referred to therein.

The Hon. Mr. Ferguson had much pleasure in complying with a request made to him, that he should move the adoption of the Report. He had read the paper just before coming to the meeting and considered it a most satisfactory Report, indicating a great deal of useful work accomplished. It was very suggestive under several heads; but he would only detain them to remark on the scope that was presented in this island for the saving of money expended to the amount of over a million of rupees annually in importing live-stock, especially cattle, sheep and goats from India. In this respect they had lessons to learn from the West Indies, where so many minor Colonies had Government Stock Farms, and freely imported pedigree stock for improving their cattle, sheep, goats and pigs. Dr. Sturgess's department had already done a great deal of good; but one felt there was room for much more to be effected among the villagers throughout the island who ought to be taught to profit by improved stock. With these few remarks he had pleasure in moving the adoption of the Report.

Mr. Dunuwilla seconded.

The motion was carried.

The Governor's Speech.

H. E. the Governor:—Before putting this motion to the meeting, I should like to say one or two words in connection with the Report. Equally with Mr. Ferguson I find this Report is extremely interesting in more senses than one. In the first place it gives

us a very fair record of what has been done, and the progress that has been made by means of the Society's operations in the cause of agriculture generally. And what is to my mind even more important is the fact that the Report generally contains very valuable suggestions as regards the future development of the Society. Before I touch on these particular points I should say that the thanks of all the members of the Society are due to the gentlemen who, in this Report, are called "the workers." They have done much, not only because they love agriculture in itself, but for the higher principle of doing good to the land in which they live. (Hear, hear.) It is, gentlemen, such as these "workers" that the Society will always have to depend upon, and we cannot be soo sufficiently grateful for the spontaneous efforts that they have made to advance the cause that the Society has so much at heart. The Society, as has quite rightly been said, has attained early in its career one useful purpose, namely, that it has been the medium between individuals and the different agencies to meet their wants. (Cheers.) However, to my mind this Report is a valuable one, in so much that it foretells what practically means two branches in the Society. One is what you may call the English-speaking branch—and a most important branch it is. It is that branch which brings us all here together to-day; it is in order to discuss these matters of agriculture. It is a matter which is of the greatest importance to the Colony, that, in what is the Colony's Chief Industry, namely, agriculture, both Europeans and Ceylonese so meet here

UPON A COMMON PLATFORM AND ENGAGE IN DISCUSSIONS ON A SUBJECT INTERESTING TO BOTH,

and upon which we all can get not only individual improvement, but mutual benefit. (Hear, hear.) I say, therefore, that this Society may have as its principal branch this English-speaking branch, and this English-speaking branch should as far as is possible be self-supporting. (Hear, hear.) I am glad to see from the Report that the Finance and Publication Committee have at all events made a considerable step in this direction. I have, no doubt, in progress of time, they will make even one more step forward, because one of the points on which I can give a perfectly unbiassed opinion, coming fresh to the Colony, is that I have not seen one publication so interesting, so well got up, and so cheap for the money, as is the "Tropical Agriculturist." (Hear, hear.) As I say, these meetings between us all here, I regard as of much importance, but it is a question for the Managing Committee to consider whether, perhaps, it is not too often to meet once a month. I think so, not from the fact that we have not had very interesting discussions here, but from what I notice from the papers —which is that we constantly have to fall back upon Peradeniya to find a paper for the monthly meeting. I should like to see very much at every meeting two papers read —one by our professional experts, and the other by a layman who is an ordinary member of the Society. (Cheers.) I think it would do good. It would mean that co-operation which, as regards the Society as well as everything else, means everything to the strength and the life of the body interested. (Cheers) The other branch, which is just referred to in the Report, is what I might call the vernacular speaking branch, and it is a matter on which I said a few words when I last occupied the chair here. I am glad to see that

THE SOCIETY HAS VEERED IN THE DIRECTION OF THE VIEWS WHICH I THEN EXPRESSED,

and which I said I did express with some hesitation, because I had not been in your midst a sufficiently long period to study the matter as thoroughly as I could have wished. It gives me, therefore, some encouragement to think that the Society, with the wisdom which they have, and the knowledge of local matters, takes kindly to these ideas, and that in any efforts which I may make in that direction I will have their co-operation, and equally that I shall be able to give whatever assistance I can to the Society in that didirection also. I may just read the two paragraphs to which I particularly refer. The first is on page 4.

"Altogether there would appear to be a tendency to give to rural education that turn which it so much lacks at present."

The other is on page 5, and reads: "For more direct and effective work among our village population it is much to be desired (1) that an executive Board should be formed with Provincial Boards over which the Revenue Officers should preside, and the operations of which they should control with the advice of the Central Board; (2) That a larger staff of trained Agricultural Instructors should be appointed to carry on systematic work, according to an approved plan, under the Revenue Officers."

I think that last quotation is very much on the lines of remarks which I made the last time I was speaking. It is a sound principle, thoroughly sound. As regards how it can best be carried into effect we must not be in a hurry. It requires very close and careful consideration, because in all these matters dealing with the agricultural population, when you once make a step forward it is very difficult to retrace that step, and you must, therefore, practically make sure of what you are doing. As regards the matter of teachers, many of you will remember that I said: what we stand urgently in want of in all our country districts is a number of Mr. Driebergs —(hear, hear)—men who have a thorough

knowledge of the natives, men who know the vernacular thoroughly, men in whom the natives would have every confidence. To get them future teachers will be boys drawn as far as possible from the best families, on the understanding that when they have gone through the requisite training they will obtain a Government appointment,

WHICH WOULD BE IN THE AGRICULTURAL BRANCH AND IN NO OTHER,

As regards the country districts, as I have already said, I believe that teaching should be done as far as possible in the vernacular, and that the English should be limited to the elementary standards. In this connection I should like to draw your attention to the fact that whatever machinery is organised, and in whatever way we bring this necessary *desideratum* into effect, the provincial or local branches of the Society will be of the greatest assistance. (Hear, hear.) I regard these branches in the future as being the working basis of the movement, and they therefore, should derive every encouragement at the present time for what will be their object in the future, namely, to push forward agriculture in their own districts to the best of their ability in accordance with prescribed programmes which may be laid down from time to time. In such a way one of these provincial branches has just been at the present moment—or rather, I hope, it will be—made use of. It is in connection with the tobacco industry in Jaffna—a matter which has been engaging the attention of this Society. (Hear, hear.) When I was at Jaffna few days ago I promised them the assistance of the Government, provided that I got the co-operation of the tobacco planters, because, as the Society quite rightly mentions in their report to-day, such co-operation must be a *sine qua non*. But in carrying out the experiments, they will be made in the direction you have indicated in your Report. I consider in turning it over in my mind, that the best machinery I can make use of in order to carry them into effect, considering that our own professional officers cannot be always on the spot, is to make use of the provincial branch of this Association, and I hope to put matters in such a way that, this branch of the Association will be one of the first in carrying out an object lesson which, I hope will in the future, be common to other branches in the Island. I am glad to notice the observation that you make about School Gardens, and particularly the good work which they are doing. Long may they continue to do so. But, of course, if the revised scheme comes into effect these School Gardens will eventually be absorbed in the Agricultural Schools. The School Gardens will be found at the Agricultural School as part of practical training, for, of course, in these agricultural schools we want not only theoretical teaching, but also practical demonstrations. You refer also in the Report to the co-operative credit system. I am glad to find in certain portions of the Island that a commencement at all events has been made in this very necessary arrangement by the efforts of the people themselves. I brought up the question the other day at the Durbar of Kandyan Chiefs at Kandy, and one of the Chiefs gratified me immensely by telling me how great had been

THE SUCCESS IN HIS DISTRICT BY THEIR PUTTING TOGETHER A FEW HUNDREDS OF RUPEES

which enabled them to buy seed paddy and allow the cultivator to have it at a reasonable rate of interest instead of being his exposed to the usurious rate of interest which he had hitherto been accustomed to. Again, it is only recently during my visit to the North I found in the Wanni district, that it was not an unusual thing for the paddy cultivator there to pay no less than 120 per cent. upon the valuable seed paddy which he got for his cultivation. Now it is in this co-operative credit system that I hope I shall be privileged during my period of administration to help the Society and help the people and the peasantry immensely. (Hear, hear.) I have no doubt but that I shall be able to so lay matters before the Secretary of State that he will permit Government to help the people to establish this co-operative credit system in the form of agricultural banks in such a way that we can give direct help to the working population and relieve them from the burdens which they too often have to undergo from the fact of their having to borrow money at such heavy rates of interest. What we want especially to do is to push forward our Ceylonese peasantry so that they shall not be contended with cultivation such as they have now, but that they can go in for many more items of cultivation such as pepper. cotton, tobacco, and other things which I might mention in order that they shall establish an export trade; because, in order to increase our exports it is most important that we should push forward the Agricultural industries. Natives already have wealth in the coconut and in cinnamom. What they have done in those I should like to see them do in other products, because all exports mean money coming into their pockets, and, therefore, an increase in the prosperity, health and comfort of the rural population. You, therefore, can take it from me that the perusal of the Report gave me ome considerable pleasure,

I HAD HAD SOME FEELINGS OF HESITATION AS TO WHAT WAS TO BE THE FUTURE OF THIS SOCIETY,

but I feel that if the Society takes up the lines which are indicated in this Report and pay attention to what I have tried to describe to-day as its two principal branches the Society will be fraught with good and

be of lasting benefit to the island. (Hear, hear.) What we have to do is considerable, and mind you in this matter there must be no cast-iron hurry. That would be a mistake. We must gradually bring home to our vernacular speaking peasantry the advantages of scientific agriculture, and open a door for their advancement in this particular and in the general conditions of life. If in the few years that I am here any progress can be made in this direction, I shall not think that I have altogether been unsuccessful at all events in one branch of my administration. With these few remarks I beg to put to the meeting the proposal which has been moved and seconded that the Report be adopted.

HIS EXCELLENCY called on Dr. Willis to read a "Memorandum on Alkali and Water-logging in Irrigated Lands."

Dr. WILLIS explained that Mr. Smith had written the paper at his request in consequence of representations made to him by rice cultivators in the Hambantota District of their crops suffering from the causes pointed out.

(The paper appears on page 549 of this number.)

Dr. J. C. WILLIS offered a few remarks about the neutralisation of salts. Plants which would not stand common salt only, would if the salt were mixed with others do better.

Mr. M. KELWAY BAMBER remarked that it would be well worth investigating these salts to find what they actually were. Travelling about in the North, thought the area suitable for cultivation was not very large as far as he had seen. It was only on lands near the sea they were likely to get these salts.

Mr. F. M. MACKWOOD:—Mr. Willis in his remarks said that alfalfa was the English lucerne. I thought it was a Mexican plant. If it is the English lucerne, it will not be of any use to us in Ceylon.

Dr. WILLIS:—Alfalfa will not do well below 5,000 feet. Above 5,000 feet you get it as a fodder plant at Nuwara Eliya. It must be often weeded. But we have local plants which might be used instead of it.

Mr. MACKWOOD:—How does it come to have the name alfalfa?

Dr. WILLIS:—In England it is known as the lucerne. There it is hardly cultivated. In America where it is cultivated in large quantities it is known as alfalfa.

Mr. BAMBER remarked that if tobacco was to be tried in the neighbourhood of any of those lands they might grow dadaps as well which would come in useful. In Sumatra they grew a large quantity of dadaps on land where they tried tobacco.

Hon. Mr. FERGUSON said he thought they were indebted to Mr. Macmillan for a paper [reproduced in full in this issue] of special interest to the community at large. The only omission he noticed was ***Erythrina indica*** which grew freely in certain Colombo Gardens. Dr. Willis could doubtless tell them why it was omitted.

Dr. WILLIS said it would not make a good shade tree owing to its large brittle wood, which constituted a danger to passing horses. He mentioned an instance of an unsuitable shade tree which had been planted in another Colony. Owing to its large fruits it constituted a danger to traffic, and so all the trees had to be cut down.

H.E. the GOVERNOR said he was sure they all felt indebted to the writers of the papers—one a professional and one a layman—and that cordial thanks were due to them.

Hon. Mr. FERGUSON moved a vote of thanks to His Excellency for presiding—carried by acclamation.

H.E.'S REPLY.

H.E. the GOVERNOR:—I think I am conveying the opinion of the meeting when I thank the two gentlemen who prepared the papers for our discussion to-day very much indeed. The papers were extremely interesting and were of the nature which I alluded to just now, one from an expert and the other by a layman. I should very much like to see this followed in all papers which are read at the Society.

THE CULTIVATION AND CURING OF TOBACCO AS FOLLOWED NEAR DINDIGUL, MADURA DISTRICT.

BY C. BENSON, M.R.A.C.,
Deputy Director of Agriculture.

The land chosen for tobacco cultivation is a light loam, either red or ash-coloured, resting on a gravelly sub-soil. It is therefore naturally well drained. Great stress is laid on the quality of the well water and a peculiar brackish character is specially desired, and great differences in the quality of the produce of otherwise similar gardens are almost universally attributed to the quality of the water. As the ryots endeavour to get as much produce out of their land as possible, a grain crop is usually harvested during September, and when this is cut, the tobacco crop follows; and in some cases two grain crops even are taken yearly besides

tobacco. Some of the ryots, however, usually retain half the area of their tobacco land for tobacco solely, planting the balance with a first crop of kambu or other grain. In some cases where tobacco followed Sorghum, the growth was less satisfactory than when it followed kambu and the parasite ***Phelipœa indica*** (malle or bódu) was found to be more prevalent and the quality of the leaf lower.

Ploughing does not commence till September and is continued through the rains. It is done seven or eight times and the land brought into fine tilth to a depth of 4—5 inches, if the weather is favourable; but in some cases the land is ploughed too wet with the result that clods are formed, which might be avoided by a little less haste. No other implement than the native plough is used for cultivation; and levelling and ridging is done with the *man-vetti*.

Soon after the grain crop is cut, cattle, goats and sheep are penned on the land every night for a month or six weeks. Though the land is manured heavily in this way, the droppings of these animals are exposed to sun and rain, till a considerable area has been manured, and they are then ploughed into the soil. The risk of loss from this exposure might be largely avoided, if the folds were made in long rectangular instead of square pens, and if the manured portions were ploughed up sooner. Some of the richer ryots collect their cow-dung and place it in heaps on the field; others use this manure for fuel. Village refuse or sweepings and ashes, and in some cases, the stems of the previous tobacco crop are also used as manure.

The seed-beds are merely parts of the field with little banks raised round the sides to retain the water. No attention is given to their situation as long as they are close to the well. Exposure to hot sun, wind, and driving rain, is not thought of. The beds are usually about 5′ × 5′ square. The surface of the bed having been worked up to a fine state with the hands, the seed is scattered broadcast without ashes or any other mixture. Very little manure is used for the beds, as it attracts grubs and other insects. After sowing, the beds are worked backwards and forwards with the fingers to cover in the seed. The beds are then watered from a channel connected with the well, being literally flooded to a depth of half an inch or more. This necessarily cakes the surface, and but a limited number of seeds germinate in irregular patches; the portion opposite the inlet for water being washed nearly bare, and any low-lying portions so much flooded that nothing grows there. Germination takes place in seven or eight days, but many plants grow very slowly, so that the general effect is most irregular. The beds are never covered or sheltered, and as they are watered in the early morning, the hot sun by caking the soil retards the growth of the seedlings and causes many to wither away; results which are invariably put down to the wind, etc. The seedlings also naturally get much damaged by being trampled down whilst being weeded or extracted for transplanting.

About six to seven weeks after germination the seedlings begin to show three leaves, but it is not till the leaves are three or four inches long that they are taken out for transplanting. When the plants are ready for transplanting, the beds are flooded in the morning and the plants pulled out. The seedlings are kept in a house in a well-covered basket and transplanted in the evening. In pulling up the seedlings many of the smaller plants are dragged out and destroyed.*

Previous to transplanting, the land is ploughed up, and ridges and furrows are made two feet apart with the *man-vetti*. Before planting the channels are flooded, and the seedlings set out one foot apart on the sides of the ridges in much the same way as paddy is planted. The soil is often so sloppy that the plants fail to take root, and in consequence, wither away and die. The ryots are aware of the necessity for the seedlings being firmly planted, but owing to defective supervision their servants scamp the work.†

For three days after planting, the seedlings are at first watered every morning, though in some cases only on alternate days. When they have taken root, water, if it is desired to extend the area planted, may be withheld

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* A modification of existing practice in respect of the seed-beds may be suggested. The beds should be just so wide that a man can reach the middle of them from the side; and the extreme width should therefore be about four feet, though two or three feet is preferable, and a bed 12′ × 3′ should produce enough plants for an acre. These beds should be raised higher than the water-channels which may be made all round them so as to avoid, as far as possible, watering on the surface, and watering by direct flow should be avoided. In preparing it, the bed should be deeply dug over and may be manured with ashes and thoroughly rotten manure. The surface should then be raked fine, and the seed scattered evenly over it, having been mixed with ashes or sand to facilitate this. After sowing, the surface should be lightly pressed or lightly covered with clean ashes, and watered very lightly—by preference with a can and rose—the whole mass of soil being moistened by flooding the side channels.

† The planting is much too close, as the plants grow and cover the ground so completely that the labourers cannot move freely through the crop for suckering and removing grubs, or to hoe the land, and earth up the plants properly. As the leaves become interlaced, they also damage each other when there is any wind. Probably it would be much better if the rows where three feet apart, and the plants possibly 18 inches apart in the lines.

for four or five days, but subsequently the crop is watered once in three days until it is hoed, and thereafter every other day.

After the crop has been planted, weeds spring up plentifully, and are often allowed to grow for some time, but, when it is about three weeks old, it is hoed, though this operation is delayed longer in some cases. About five or six weeks after planting, the land is further broken up with a *man-vetti*, and though this operation may be repeated, if the surface becomes very hard, it is seldom that this is done, and the ryots appear to have no idea of the great benefits of maintaining a surface mulch by keeping the soil loose and friable, and especially so after a fall of rain or a watering. On the day following this hoeing, one slight earthing up of the plants is done, and watering on alternate days is renewed.*

In some villages, two days before the first hoeing mentioned above, liquid manure is applied to the tobacco plants. Fresh cow-dung is gathered some days previously and placed near the main channel. This is mixed by the hands into the water drawn from the well which carries the manure to the plants. Such manuring is seldom practised, except in Vedasandur, but there liquid manure is applied two or three times whilst the crop is on the ground; the second application being made when the plants are topped, and a third, more rarely, immediately before harvest.

The plants are topped† when they are 2½—3 feet high and a few days before the bud appears. The plants have then been about two months in the field and carry from nine to twelve leaves. The tops are thrown anywhere, and those which fall on the tobacco leaves, from their extremely gummy nature, cause the leaves on which they fall to rot. Topping the plants so low induces the leaves left to spread and increase in size, and is usually supposed to be conducive to an increased weight of outturn, as compared with that from plants topped higher.

The plants ripen in ninety to one hundred days, and when a few spots have appeared on the lower leaves, the plants are cut off * close to the ground at about 5 p.m. They are then allowed to remain exposed to the night dew, and at day-break are gathered up and bulked into small circular heaps 2 feet high, the stalks outwards, and the tips of the leaves inwards. These heaps are covered with straw or the refuse of the tobacco field (tops, suckers, etc.), and are not opened till the third evening after the harvest. The plants are then spread on the ground for a short time, and then hung up on horizontal poles with the stalks pressed close to each other. The stalks of the plants are slightly loosened from each other every morning all along the pole† The leaves are cured in fifteen to twenty days from time of hanging up, the colours being rusty red, yellow and green. Where the leaves have been too closely pressed together, the colour is black and texture rotten. Rain destroys the colour and texture, and high winds break and damage the dry leaves.

When the stems of the leaves have become thoroughly dry, although the stalks may still be green, the plants are taken down and bulked in square heaps, the stalks being laid cross-wise over each other in alternate rows. These heaps are two feet or more in height. The leaves are not stripped from the stalks, but bulked just as they are taken from the poles. This is done in the early morning when the leaves are supple. These bulks are opened and re-bulked every two or three days. The smell issuing from a newly-opened bulk is very offensive, the stalks show signs of mould, and the leaves sweat and blacken to such an extent that unless great care is taken, the texture of the leaf is entirely destroyed.‡ When a blackish colour is produced, the fermentation is finished, and the leaves are stripped off the stalk, and tied

* Hoeing should commence as soon as the plants have struck root, and be continued regularly, and persistently, as long and as often as needed to keep the surface clear of weeds, and open and free. The ridging up is also usually more or less ineffective, and might be more thoroughly done. If the plan of watering in only alternate furrows on each occasion, and hoeing the land so watered as soon as possible after watering, were adopted, the crop would certainly benefit, and it is probable that much less water would be needed.

† Immediately after topping, shoots or suckers appear in the axils of the leaves, and around the head of the plant; but suckering is done once only, about a fortnight after topping, and very ineffectively, as the suckers are allowed to grow far too large and too long to the great detriment of the plants, and are not removed sufficiently often. They should be removed when an inch long, and the crop should be gone over continually for this purpose.

* Cut as they are in this way, the upper leaves on the plant are still immature, while the bottom leaves may be over-ripe, and it would be well if the latter could be stripped off separately, and in fact the whole be harvested as it ripens. The lower leaves might be strung on twine and cured, and when the remainder matures the whole plant could be cut.

† In the curing too, the plants at present appear to be hung up much too closely together, so that there is no uniformity in the drying, and the colour is far from uniform whilst those leaves which are not we l exposed turn black and rot. The harvested plants might be hung up loosely, and further apart, and it might also be advantageous if the stems were split in two before being hung up; the leaves would then dry more evenly and quickly.

‡ The injury done during fermentation is great, and is largely due to the fact that the ryot has no guide by which to control it. For the proper regulation of this, the thermometer is required.

up into bundles of 50 leaves weighing 1½ to 2 lb. each, and baled.*

In many cases a mixture of jaggery and water is sprinkled on the leaves after the fermentation is over. This gives the leaves a sour-fermented smell, and also a fictitious texture, as they can be stretched more easily when the jaggery has soaked into them. This, however, disappears after a time.

The produce of one acre of tobacco cultivated in the above mentioned way ranges from 800 to 1,000 lb.—*Department of Agriculture, Madras*, Vol. III, Bulletin No. 53.

¶ No attempt at sorting the leaf is made, but on the other hand, the ryot tries to conceal bad leaf inside the bundles; and it is probable that, by care in sorting, the grower would obtain more from his labours.

LITERATURE OF ECONOMIC BOTANY AND AGRICULTURE, XXX.

Rubber—Cultivation.

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Rubber cultivation and the future production. Wright in "T.A." Dec. 1906, p. 442.

Rubber cultivation in Samoa. "T. A." Nov. 1906, p. 375.

Rubber cultivation in the British Empire. Wright. Jam. Bull. Apr. 1907, p. 96.

Progress of rubber planting. Ind. Rub. World, Aug. 1907, p. 339.

World's rubber industry. Ind. Rub. Journ., 23. 9. 1907.

Progress in rubber cultivation, do. July 1907, p. 151.

NOTES AND QUERIES.

BY C. DRIEBERG.

NORTHENER.—Even if an introduced variety of tobacco is found to succeed in the North, there will be a serious difficulty to face if all tobacco cultivators do not agree to grow the same variety, as hybridization is bound to follow unless steps are taken to guard against cross-fertilization. Otherwise, fresh seed will have to be constantly imported for each planting season.

KAPOK.—The Philippine Agricultural Review for January says that the latest reports on well-cleaned samples of kapok gives the market value as 14 cents American currency, per pound. The firm making this report offers to make a contract for all the kapok that the Philippines could produce. A cleaner, described as a combination of a cotton gin and a thrashing machine is said to have been designed by the Assistant Director of Agriculture in the Philippines.

F.—As you say, the explanation, given in the last May Magazine, of pruning causing fruit production is not very acceptable. The writer appears to believe that the injury caused by pruning is "understood" by the plant as "a threatening of its existence," and that it makes an effort to preserve its own kind before extinction. This endows plants with responsible intelligence, which is not admitted by scientific men. The tendency on the part of the plant to produce fruit when injured is no doubt a provision of nature, but must be attributed to physiological action in the plant, such as is referred to in para 5 of the article (p. 455 of May *T. A.*).

E. N.—I do not think you have any good cause for complaint. The Society cannot extend its help to those who do not consider the benefits derivable by joining it worth the modest sum of Rs. 8 per annum. I shall be only too ready to serve you as a member, but as a non-member you have no right to expect assistance or advice in any form. You can, however, get any particular number of the magazine for one rupee, or subscribe to it by paying (as a non-member) Rs. 10 per annum. On the other hand, as a member, you will get the magazine and all the benefits the Society can offer for Rs. 8.

MUSA.—With reference to your queries about plantain fibre, the following extract from a letter dated March 5th, 1908, received from the Botanist in charge of Fibre Plants, United States Department of Agriculture, will give some useful information:—"The specimens of fibre which I have examined from plantain and banana plants have been inferior in strength to the fibre produced by abacá, *Musa textilis*, in the Philippines. I am told that one of the species from Africa, *Musa ensete*, yields a fibre which it is thought will compare favourably with the genuine abacá. The best specimens of banana fibre that I have seen came from Jamaica, but these fibres lacked uniformity. Some of them were strong, while others were very weak. I do not think that it will be possible to prepare the fibre from banana plants produced in the American tropics at a cost that would permit them to enter the American market so as to compete with abacá and sisal, now used by our manufacturers. It might be possible, however, with the different labour conditions of India to produce these fibres so as to be used in the local market there, and it is also quite possible that you have varieties there yielding stronger and more uniform fibre than those produced by the common, large, yellow banana of the American tropics. Three or four machines have recently been used in the Philippines for cleaning abacá fibre, and it is quite probable that these machines might be used successfully in cleaning Banana fibre. It is said that one of the most promising of these machines is the one invented by Mr. Eugene Behrendt, and manufactured by the Watson Machine Company, of Paterson, New Jersey. Banana fibre may also be cleaned on a machine made by the Finigan-Zabriskie Company at Paterson, New Jersey, providing the leaf stalks are first put through crushing rollers to break down and soften the tissues."

BEEKEEPER.—You will see from the report submitted at the General Meeting on the 15th instant, that native bees do best in a small hive. You can see one made according to Mr. Shank's specification at the Stock Garden. Mr. W. K. Morrison, a well-known authority, considers *Apis indica* bees as promising material to work with. The Hon. Mr. Obeyesekere secured some nicely filled combs not long ago. The great point is to watch and prepare for the "honey-flow."

Correspondence.

DRYING OF CACAO.

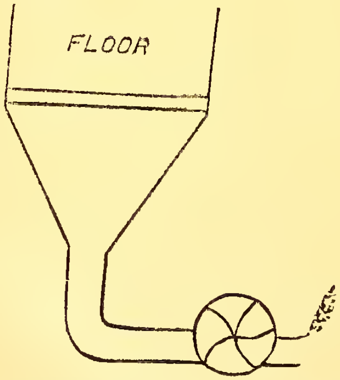
Botanical Department,

Trinidad, 25th January, 1908.

SIR,—I am in possession of your letter of 12th December, 1907, asking information as to the process of drying cacao in Trinidad, and for plans of drying houses.

The information you require is given in my work on cacao, a copy of which was forwarded to Ceylon some years since; and there are illustrations of some of the best drying houses in Trinidad and Grenada in Preuss' account of his expedition to Central and South America, 1899-1900.

To these may now be added the artificial dryer made by Gordon of London, and that used by Hoadley in Trinidad. These are mechanical dryers of an expensive character, the latter doing its work extremely well. Its main parts are first a circular floor pierced with holes to which hot air is driven by blast from below, by means of a funnel-shaped apparatus, the cacao being kept moving by rotating ploughs which throw the cacao from side to side with a slow motion.



The majority of estates, however, still depend upon sun heat on open floors covered by a running roof to protect against rain. These are made in various forms and sizes, to suit each particular position, but in general are elevated, so as to give rooms beneath for fementation boxes and storage &c. The floors are of wood universally.

The manipulation of the cacao is well given in the Bull. Miss. Information, Trinidad, 1904, p. 113, which is the method adopted on the Government Estate under my charge and is written by the manager. For cacao made by this process we invariably obtain highest market prices. It should be noted, however, that it is applied to a strain of cacao dominated by the Forestero variety, and if the Criollo varieties are to be treated the period of fermentation would be shorter, but the general treatment the same.

In Grenada the houses for drying are somewhat different from those in use in Trinidad, as in the former the trays are made to draw out on rails, and are shut up when rain falls, while in Trinidad the floor is always stationary and the roof moves. There is more labour in the Grenada method as the whole weight of cacao has to be moved, while a single man can cover in the Trinidad floor. The roof run on wheels on light railway rails. The methods of fermentation and drying are well described by Wright in Chapt. IX. of his work on Cacao. No washing is used in the preparation of Trinidad cacao, as it is found that the mucilage properly treated forms a protective covering to the bean preventing the entry of mould fungi to a large extent, and obviates breakage of the shell of the bean.

A description of Hoadley's drier is to be found in the West Indian Bulletin, and also in Trinidad Bull., p. 209, 1905, Vol. VI.

I regret I am unable to forward you plans of our Cacao houses, but they are simple in the extreme, and a view of one of Preuss' illustrations should be sufficient to enable any intelligent mechanic to construct a suitable building.

If I have omitted anything that you specially require the details of, I shall be glad to oblige later.

Meanwhile I remain,

Yours faithfully,

J. H. HART,

Superintendent, R. B. Gardens,

Trinidad.

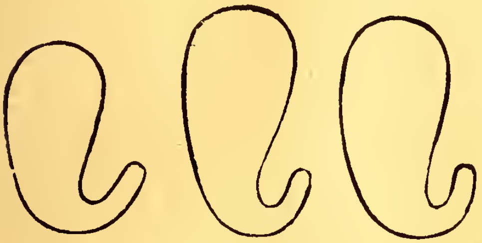
The Director, Royal Botanic Gardens,
Ceylon.

CALABASH GOURDS.

Crystal Hill Estate,
Matale, 24th April, 1908.

DEAR SIR,—With reference to your article "Possible Market for Calabash Gourds" appearing in the February number, I wish to know whether there is a species of the "Lagenaria vulgaris," shaped as in sketch enclosed. I am informed by the Manager, "Calabash Pipe Factory," that these are the suitable shapes of Gourds required, and that they give as much as £35 a thousand for the finest shapes free from flaws imported from South Africa.

Yours faithfully,
A. VANSTARREX.



FUNGUS ON RUBBER PLANTS.

DEAR SIR,—With reference to your note *re* my letter published in the January Number, p. 69, I very much regret I have troubled you and will not offend you or any of your colleagues again by worrying them *re* any pest, animal or fungoid. I may say I got almost an identical reply from the Government Entomologist, Mr. West, viz., to refer my queries to your own (*i.e.*, my own) Entomologist at Pusa, and from the Mycologist who writes "these specimens (which he returns) should be sent to the Agricultural Department of Burmah or India, I cannot make anything of them." Yet they were properly prepared and pressed herbarium specimens. There is a curious immunity about the above.

The Prospectus, if I may term it such, of the C. A. S. clearly offers as inducement to join, that help and advice will be given to its members, and this is the help ! !

I would have imagined that all and any individual effort to detect rubber diseases or pests, and to record their action or life history would have been welcomed rather than deliberately snubbed. However, I can assure you I will not trouble you or any of your colleagues further.

Please publish this letter and oblige.

Yours truly,
J. G. F. MARSHALL.

Tavoy, 18th April, 1908.

[Our correspondent forgets two facts : first, that we are not anxious to have foreign diseases sent about Ceylon by post, with the risk of infecting our local plants ; second, that our Entomologist and Mycologist are occupied all their time in attending to local diseases, and cannot spare time for others, especially as these others have first, not being the same as ours, to be identified, a work which may take hours or even days.—ED.]

OLIVES GROWN IN CEYLON.

Talawakele, 22nd May, 1908.

DEAR SIR,—I send you as a curiosity what I believe to be the first olive grown in Ceylon. I imported the plant (then 4 years old from seed) in January, 1901, and (although it is a well-grown tree over 20 feet high and with two stems as thick as one's arms) this is the first return. About a year ago I lost patience with it, and bored an auger hole through it to which I attribute the change of habit.

I have a few struck cuttings which are at your service in the interests of science. Uva is the potential home.

Yours,
JAMES RYAN.

[The olive was distributed, a good many years ago, from Hakgala to places in Uva, but we have not yet heard of any fruiting.—ED.]

THE "CARNAUBA" PALM.

Poilakanda, Gampola, Dec. 14, 1906.

DEAR SIR,—The "Carnauba" tree is very fully described in the "Tropical Agriculturist" for January, 1906, page 814, and the very many places where it grows so well in South America.

I feel sure this Palm would do well in some of the dry and sandy parts of this Island.

I shall be much obliged if you can give me any address where I can write to secure the seed of this Palm,—and any further particulars as to price and how the seed could be brought to Ceylon in a good state of preservation,

I am, Dear Sir,
Yours faithfully,
A. H. THOMAS.

[We regret we do not know of anyone who can supply.—ED.]

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Monthly Price Current, London, 13th May, 1908.)

	QUALITY.	QUOTATIONS.
ALOES, Soccotrine cwt.	Fair to fine ...	85s a 90s
Zanzibar & Hepatic ,,	Common to good ..	20s a 70s
ARROWROOT (Natal) lb.	Fair to fine ..	2⅞d a 4d
BEES' WAX, cwt.		
Zanzibar Yellow ,,	Slightly drossy to fair ...	£6 10s a £6 15s
Bombay bleached ,,	Fair to good	£7 12s 6d a £7 15s
,, unbleached ,,	Dark to good genuine ..	£5 15s a £6 10s
Madagascar ,,	Dark to good palish	£6 10s a £6 17s 6d
CAMPHOR, Formosa ,,	Crude	nom.
China ,,	Fair average quality ..	145s
CARDAMOMS Malabar lb	Good to fine bold	1s 8d a 1s 10d
	Middling lean	1s 3d a 1s 5d
Tellicherry	Good to fine bold ..	1s 9d a 2s 3d
	Brownish .	1s 4d a 1s 6d
Mangalore ,,	Med brown to fair bold	1s 6d a 2s 3d nom.
Ceylon.-Mysore ,,	Small fair to fine plump	1s 2d a 3s 3d
Malabar ..	Fair to good ..	1s 3d a 1s 4d
	Seeds ..	1s 6d a 1s 9d
Long Wild ,,	Shelly to good ..	6d a 1s 6d
CASTOR OIL, Calcutta ,,	1sts and 2nds ..	3d a 4d
CHILLIES, Zanzibar cwt.	Dull to fine bright ...	17s 6d a 20s
CINCHONA BARK.—lb.		
Ceylon	Crown, Renewed	3⅜d a 7d
	Org. Stem	2d a 6d
	Red Org. Stem	1¼d a 4¼d
	Renewed	3d a 5¼d
	Root	1⅞d a 4d
CINNAMON, Ceylon 1sts	Common to fine quill	8d a 1s 3d
per lb. 2nds	,, ,,	7½d a 1s 2d
3rds	,, ,,	6d a 1s
4ths	,, ,,	5½d a 8½d
Chips, &c..	Fair to fine bold	2½d a 3⅛d
CLOVES, Penang lb.	Dull to fine bright bold	9d a 1s
Amboyna ..	Dull to fine	7½d a 8d
Ceylon ..	,, ,,	7d a 8d
Zanzibar	Fair and fine bright	4¾d a 5¼d
Stems ..	Fair	2d
COFFEE		
Ceylon Plantation ,,	Bold to fine	110s a 116s
	Medium to good	80s a 100s
Native	Good ordinary	nominal
Liberian ,,	Fair to bold	48s a 54s
COCOA, Ceylon Plant. ,,	Special Marks	82s a 88s
	Red to good	75s a 80s
Native Estate ,,	Ordinary to red	65s a 71s
COLOMBO ROOT ,,	Middling to good	12s 6d a 15s
CROTON SEEDS, sift. cwt.	Dull to fair	30s a 35s nom.
CUTCH ,, ,,	Fair to fine dry	21s a 25s nom.
GINGER, Bengal, rough ,,	Fair	30s
Calicut, Cut A ,,	Small to fine bold	72s 6d a 85s
B & C ,,	Small and medium	50s a 65s
Cochin Rough ,,	Common to fine bold	35s a 38s
	Small and D's	33s a 35s
Japan ,,	Unsplit	28s
GUM AMMONIACUM ,,	Sm. blocky to fair clean	25s a 60s
ANIMI, Zanzibar ,,	Pale and amber, str. sorts.	£16 a £18
	,, ,, little red	£13 a £15
	Bean and Pea size ditto	72s 6d a £13
	Fair to good red sorts	£9 a £12
	Med. & bold glassy sorts	£6 10s a £7 10s
Madagascar ,,	Fair to good palish ...	£4 a £8 10s
	,, ,, red ...	£4 a £7 10s
ARABIC E. I. & Aden ,,	Ordinary to good pale	25s a 32s 6d
Turkey sorts ,,		32s 6d a 50s
Ghatti ,,	Sorts to fine pale ...	17s a 42s 6d
Kurrachee ,,	Reddish to good pale ...	20s a 30s nom.
Madras ,,	Dark to fine pale ...	15s a 25s
ASSAFŒTIDA ,,	Clean fr. to gd. almonds	85s a 100s
	com. stony to good block	25s a 75s
KINO ,,	Fair to fine bright	6d a 1s
MYRRH, picked ,,	Fair to fine pale	£5 a £6
Aden sorts ,,	Middling to good	60s a 75s
OLIBANUM, drop ,,	Good to fine white	45s a 55s
	Middling to fair	30s a 40s
pickings ,,	Low to good pale	10s a 20s
siftings ,,	Slightly foul to fine	11s a 15s
INDIA RUBBER lb	Fine Para bis. & sheets	3s 9¾d a 3s 10d
Ceylon, Straits,	,, Ceara ,, ,,	3s 9¾d a 3s 10d
Malay Straits, etc.	Crepe ordinary to fine..	3s 9½d a 3s 10d
	Fine Block ,, ..	4s
	Scrap fair to fine ..	2s 4d a 2s 8d
Assam	Plantation	3s nom.
	Fair II to good red No.1	2s a 2s 6d nom.
Rangoon	,, ,,	2s 2d a 2s 4d

	QUALITY.	QUOTATIONS.
INDIARUBBER.(*Contd.*)		
Borneo	Common to good	6d a 2s 2d
Java	Good to fine red ..	1s 9d a 2s 6d
Penang	Low white to prime red	1s 4d a 2s 3d
Mozambique	Fair to fine red Ball ...	2s 6d a 3s 4d
	Sausage, fair to good ..	2s 6d a 3s 4d
Nyassaland	Fair to fine ball ..	2s [illegible]d a 2s 4d
Madagascar	Fr to fine pinky & white	1s 10d a 2s
	Majunga & blk coated ..	1s a 1s 6d
	Niggers, low to good .	6d a 1s 9d
New Guinea	Ordinary to fine ball ..	1s 6d a 2s 6d nom
INDIGO, E.I. Bengal	Shipping mid to gd violet	3s 5d a 3s 10d
	Consuming mid. to gd.	3s 1d a 3s 4d
	Ordinary to middling	2s 9d a 3s
	Oudes Middling to fine	2s 6d a 2/8 nom
	Mid. to good Kurpah	2s 3d a 2s 6d
	Low to ordinary	1s 6d a 2s 2d
	Mid. to fine Madras	1s 5d a 2s 4d
MACE, Bombay & Penang	Pale reddish to fine	1s 5d a 1s 11d
per lb.	Ordinary to fair	1s 2d a 1s 5d
Java	,, ,, good pale	1s 1d a 1s 6d
MYRABOLANES, cwt		
Madras	UG and Coconada	4s 6s a 4s 9d
Bombay ,,	Jubblepore	5s a 5s 6d
	Bhimlies	5s a 6s
	Rhajpore, &c.	4s 9s a 5s 3d
Bengal ,,	Calcutta	5s a 5s 3d
NUTMEGS— lb.	64's to 57's	1s 4d a 1s 5d
Bombay & Penang ,,	110's to 65's	5½d a 1s 5d
	160's to 115's	4½d a 5¼d
NUTS, ARECA cwt.	Ordinary to fair fresh	17s 6d a 20s
NUX VOMICA, Cochin	Ordinary to good	9s a 11s 6d
per cwt. Bengal	,, ,,	7s 6d a 7s 9d
Madras	,, ,,	7s 9d a 9s
OIL OF ANISEED ,,	Fair merchantable	4s 6d
CASSIA ,,	According to analysis	4s 8d a 5s
LEMONGRASS ,,	Good flavour & colour	2d
NUTMEG ,,	Dingy to white	1½d a 2d
CINNAMON	Ordinary to fair sweet	2⅝d a 1s 3d
CITRONELLE ,,	Bright & good flavour	1s 1d
ORCHELLA WEED—cwt		
Ceylon ,,	Mid. to fine not woody..	10s a 12s 6d
Zanzibar. ,,	Picked clean flat leaf ..	nom.
	,, wiry Mozambique	,,
PEPPER—(Black) lb.		
Alleppee & Tellicherry	Fair ..	3½d a 3⅝d
Ceylon	,, to fine bold heavy ..	3½d a 4⅜d
Singapore ...	,, ...	3⅜d
Acheen & W. C. Penang	Dull to fine	3d a 3¼d
(White) Singapore ,,	Fair to fine	5d a 1[illegible]d
Siam ,,	Fair	5¼d
Penang ,,	Fair	4[illegible]d
PLUMBAGO, lump cwt.	Fair to fine bright bold	35s a 45s nom.
	Middling to good small	25s a 40s
chips	Dull to fine bright ..	15s a 30s
dust	Ordinary to fine bright	7s a 15s
SAGO, Pearl, large ...	Dull to fine	14s a 15s 9d
medium ..	,, ,,	14s a 16s 6d
small ...	,, ,,	14s a 15s
SEEDLAC cwt.	Ordinary to gd. soluble	£5 a £6 nom.
SENNA, Tinnevelly lb.	Good to fine bold green	4½d a 7d
	Fair greenish	2½d a 4d
	Commonspeckyand small	1¾d a 2d
SHELLS, M. o'PEARL—		
Egyptian cwt.	Small to bold ..	47s 6d a £5
Bombay ,,	,, ..	20s a 95s nom
Mergui ,,	,, ,, ...	£4 17/6 a £75 ,,
Manilla ,,	Fair to good ..	£4 a £8 15s ,,
Banda ,,	Sorts	25s a 30s
TAMARINDS, Calcutta..	Mid. to fine bl'k not stony	10s a 12s
per cwt. Madras	Stony and inferior ..	4s a 5s
TORTOISESHELL—		
Zanzibar, & Bombay lb.	Small to bold ..	11s a 28s
	Pickings ..	6s a 23s
TURMERIC, Bengal cwt.	Fair	19s
Madras ,,	Finger fair to fine bold	18s a 20s
Do. ,,	Bulbs [bright	13s a 16s
Cochin ,,	Finger ..	17s
	Bulbs ..	14s
VANILLOES— lb.		
Mauritius ... 1sts	Gd crystallized 3½ a 8½ in	8s a 15s
Madagascar ... 2nds	Foxy & reddish 3½ a 8 ,,	6s 6d a 11s
Seychelles .. 3rd.	Lean and inferior ...	5s 9d a 6s 9d
VERMILLION ..	Fine, pure, bright .	2s 9d
WAX, Japan, squares	Good white hard ...	46s 6d

THE SUPPLEMENT TO THE

Tropical Agriculturist and Magazine of the C. A. S.

No. 6.] JUNE, 1908. [VOL. II.

MR. C. E. WELLDON'S RECENT VISIT TO JAVA.

Mr C E Welldon, the well-known Dimbula planter, recently returned from a brief visit to Java and the Malay States. Mr Welldon, we learn, was vastly impressed with all he saw in Java and is prepared to yield the palm unreservedly to the Dutch Colony over both the F.M.S. and Ceylon as "an investment." A Java plantation, he calculates, would give a yield of 7 per cent. over an F.M.S. one that just paid its way, on the difference in cost of labour alone. Java, he states, has distinct advantages over the Malay States—both in regard to labour and soil; and in both these respects it is generally conceded the F.M.S. have the advantage of Ceylon. Mr Welldon estimates that R250 per acre will cover the cost of bringing rubber into bearing in Java. The growth of young rubber trees at 4 years old in the Dutch Colony is fully equal to that seen in the F.M.S.—while Malaya is a year, if not 1½ year, in advance of Ceylon.

Looking at the difference in the cost of labour in the Malay States and Ceylon, and difficulties connected with Superintendence, which will no doubt in time be overcome, Mr. Welldon would as soon own rubber land in Ceylon as in the Straits,—say, in a district like Kegalle.

As regards tea cultivation Mr Welldon is equally impressed. He had heard of the famous Malabar estate regarding which a letter from a Java correspondent appeared in the T. A. last month and there are other estates giving nearly as good results. Java is, at present, largely extending its acreage under tea. Ceylon will have to look to her laurels in the future.

Mr. Welldon was astonished at the enterprise displayed by the Government of the Dutch Colony and represented by the splendidly equipped laboratories and the full staff of Agricultural Scientists at work in Java. In fact, he regards tropical agriculture as being generally carried on by Dutch planters on more scientific methods than in Ceylon. Before commencing actual planting work in Java now, young planters often undergo a year's training at an Agricultural College in Holland as an essential part of their equipment for the work. The publications issued principally for planters would hardly be understood by the ordinary planter, Mr. Welldon assures us—a fact which we consider not at all strange as they are printed in Dutch!—but our informant meant on account of their severely technical and scientific character.

PLANT-BREEDING IN CEYLON: AND ITS FUTURE.

The appointment of Mr. R. H. Lock to be Assistant Director of the Peradeniya Department was at an early stage regarded in Ceylon with some misgiving, doubt being expressed as to whether the new-comer were not too "scientific" a man for the post. Those, however, who knew Mr. Lock's work best—at Cambridge University, for instance—congratulated Ceylon on its good fortune in securing him and for the very reason that he is "scientific": it being pointed out that in biological, as much as in other branches, it is nearly always the truly scientific men who produce the most practical and widely useful results. If more proof be wanted at this date as to Mr. Lock's fitness for the responsible post he now holds, it would be found in the specially informing, yet most concise paper, he read at the May meeting of the Ceylon Board of Agriculture and which appeared in our last number. He there reveals himself (though as modestly as possible) to be not merely a capable Assistant to the Head of our Botanic Department but the kind of expert—an expert in plant-breeding—in the possession of which Ceylon had been behind India and Egypt until he came here. When he was only "Scientific Assistant" under Dr. Willis

five years ago, and one of Mr. Lock's early researches, into the way to improve Maize, resulted--by his crossing and selection—in a strain giving yields higher than the native and almost equal to what is borne by similar American corns. Following on these experiments, other countries have taken up the study of plant-breeding, as above indicated; and Mr. Lock comes back to us in good time to extend his work from our minor to our more valuable staple products. The paper under notice (which was reproduced *verbatim* in last month's *Tropical Agriculturist*) points out, to begin with, the great advance which cultivated species in temperate climes represent upon the original wild kinds of growth. The history Mr. Lock sums up: (1) primitive man deliberately sowing seeds, aiding these by digging and weeding; (2) a long stage—selection of the better plants and propagating *them* (unlike the native tobacco-grower here, it was said); (3) plant-breeding as a trade—*e.g.* in China and old Rome, but only from 150 years back in England; and (4) applying definite science to the improvement of plants—*e.g.* Mr. R. H. Biffen (of Cambridge) obtained from two species a permanent breed of wheat, not only immune to a certain fungus but of best quality, a result obtained in one-tenth the time practical breeders would take or one-hundreth of that of the ordinary cultivator.

The practical upshot from these introductory sign-posts of Mr Lock is that they show us the way to and the nature of the goal he has set before himself in coming to Ceylon. Paddy and rubber (*hevca brasiliensis*), to name only two are to have his attention with a view to breeding to secure superior species, and even novelties or "sports." Coffee, tobacco and coconuts are mentioned later—the first-named doubtless an error for *tea!*—as presenting scope for obtaining marked improvements in the quality of the product grown. We are not blind, of course, to the fact that the benefit of much of the work to be done cannot accrue to any of the present generation of planters; and much of it again can only benefit those properties upon which it has been vigorously pursued under Mr Lock's guidance, after a good many years' attention. Our plant-breeding expert himself warns planters not to expect everything in a few years; nor indeed the *creation* of anything. These permutations and combinations, plant algebra and alchemy if you will, will be a slow process; except in the case of annually grown products. Novelties and valuable specimens have to be watched for and their reproductiveness proved by actual breeding—with strains immune from disease when these are found. Meanwhile, Mr. Lock wishes planters to bring to his notice any seedling or branch of any cultivated product which looks different from its neighbours; for it is, we may point out, by the aid of the trained man constantly on the watch for novelties that real progress will be made.

Two facts will be of special value: first, that it is hoped to arrange that anyone who first brings to notice a "sport" (or on whose land it occurs) may have first choice of any valuable strain bred from it by Government experiment; and secondly, that as scientific methods of breeding have never yet been applied to the products of Ceylon, the prospects of marked improvements as soon as these methods are brought to bear are all the greater. In concluding this notice of Mr. Lock's valuable manifesto to those who would work out the agricultural salvation of this island—with varying speed according to rate of growth of the product dealt with,—we would urge all who have become interested for the first time to act promptly on their discoveries. If insignificant novelties are made known at first, let them not cease notifying them, but continue till—like their more accustomed brother-planters—they come with facility to select only what is likely to be of real value in the widely beneficient work Mr. Lock is in a position to perform as Plant-Breeding Expert in this first of Crown Colonies.

COCONUT STEM DISEASE.

A Rival to Mr. Petch's Method of Treatment.

Mr S O L Perera, an Inspector appointed under the Plant Pests Board of the Western Province, is at present on a tour of inspection in the Kalutara district. Today he gave a demonstration to a large gathering of Headmen at the office of the Totamune Mudaliyar, Mr J V G Jayawardana, of the treatment of the coconut stem disease according to the method of the Government Mycologist, Mr Petch. His method included the cutting off with a chisel of the affected portion of the tree, scorching the same with an oiled torch and filling the hole so dug with hot tar. Mr Charles Wijeymana of Quarry House, Kalutara North, whose treatment of the coconut stem disease is known locally as very successful gave a demonstration of his method of

treatment which consisted of two mixtures which were absorbed into the tree from two holes bored at the bottom of the tree. His method of treatment is not confined to the affected portions only. It is claimed to be less expensive and more efficacious than the method adopted by the Plant Pests Board. Some of the trees, which more almost dying within the town, were experimentally treated while others were professionally treated and invariably in all the cases after his treatment showed remarkable improvement. Mr C Drieberg, Secretary of the Ceylon Agricultural Society, inspected some of the trees which were under Mr Wijeymana's treatment—*Kalutara Cor.*

We learn on enquiry from Mr C Drieberg that he inspected some of the trees treated by Mr Wijeymana (in company with the Totamune Mudaliyar). This was done in view of certain correspondence which came before him in the C. A. S. office—communications from Mr Wijeymana himself, as well as favourable reports of his 'cure.' After inspecting the treated trees Mr Drieberg expressed the opinion that the treatment looked *promising*, but that it was impossible to say anything definite till at least three months had elapsed. Subsequently Mr Wijeymana's remedy was brought to the notice of Government and an offer was made to have its efficacy tested, by the treatment of a number of trees under his eye, by the Government Mycologist. Whether this offer was accepted and the trial is in progress Mr Drieberg has not heard.

COCONUT DISEASE IN TRAVANCORE: AND THE CEYLON "BLEEDING."

Peradeniya, May 12th.

SIR,—Dr. Butler's report on the Coconut Disease in Travancore, for which I have to thank you, clearly indicates that that disease is not identical with the stem bleeding disease of Ceylon.

The symptoms, which he describes, are exhibited by the crown of the tree. "The first indication that a coconut palm is attacked is the opening out of the outer leaves from the head. The leaf stalk becomes slightly flaccid and the weight of the leaf causes the whole to drop." "Even in the first year or two the nuts are affected. They are fewer and smaller than usual." Now, the most remarkable feature of the Ceylon disease is the absence of any indication in the crown of the tree, even when the stem is seriously affected. I have seen a tree completely hollowed out to a height of fourteen feet, but the crown was as vigorous as those of the neighbouring trees which were not attacked by the disease. Again, two tall thirty-year-old trees examined a week ago have numerous bleeding patches in the top four feet, but the leaves are not drooping and each is bearing about eighty nuts. One estate, on poor soil, reported in 1906 that the crop had diminished, but no figures were given in support of this statement, and there was a general diminution of crop in 1906 from other causes. No one has professed to be able to detect the disease before the tree begins to bleed.

One or two phrases in Dr. Butler's report might, on superficial reading seem applicable to the Ceylon disease: "In some cases cracking, of the rind with exudation of gum occurs in the early stages, it is not a general symptom but only seen in a few cases." This probably refers to the exudation of gum-resin which often forms hard globular masses on the stem, and is generally produced when a leaf is torn off: it is scarcely possible that such a conspicuous feature as the black or brown patches of the bleeding disease (which are not resinous) would be dismissed so briefly, especially when it is remembered that the decayed tissue is found beneath them. "A brown discoloration frequently appears *after* cutting open the trunk. This is apparently more marked in diseased than in healthy trees. *It is not visible when first cut*, is quite unconnected with any parasite, and is probably due to an oxidation process" (italics mine.) The discoloration here referred to always occurs after a coconut tree has been cut: no doubt everybody working at the "bleeding disease" has noticed that the sound tissue, which is white when cut, rapidly turns brown on exposure to the air. But this is not a sign of disease, and Dr. Butler's words do not refer to the mass of decayed tissue which is found on cutting into a bleeding stem, particularly a young one.

It is evident from Dr. Butler's report that he has not seen trees with bleeding patches such as occur in Ceylon, nor has he found any decay inside the stem. We can only conclude that the Travancore disease is quite distinct from any disease yet discovered in Ceylon.

In the report of the Royal Botanic Gardens for 1907, I have referred to a single instance of another coconut disease in Ceylon, and have stated that it is probably identical with the Travancore disease. This new disease is indicated by the death of a single leaf about midway between

the bud and the oldest leaves—a symptom which agrees exactly with the description furnished in a letter received from Travancore early in 1907, asking that we should go over and investigate. But from Dr. Butler's report this is clearly not the same as the widespread Travancore disease which he investigated, and in that respect the statement in the Royal Botanic Gardens' Report is incorrect We share a coconut disease, but it is not the root disease described by Dr. Butler, and has apparently not been seen by him.

T. PETCH.

CAMPHOR IN BURMA.

PROSPECTS FOR CULTIVATION.

As considerable attention is being devoted to the subject of camphor cultivation in India and plantations are being opened up, notably in Southern India, a review of the position of the industry and the attempts made from time to time at the experimental cultivation of the tree in Burma with the view of examining how far there is a possible future before camphor in this province, would perhaps be interesting. It may not be generally known that in parts of the Kachin track of North Hsenwi, Northern Shan States, camphor trees occur in heavy tree jungles, but they do appear to be very numerous, the largest specimens not exceeding 2 feet in girth. The trees seen lately in this locality were tall and straight and slightly over one foot in girth. This may he due to the position, for they are surrounded by other trees. These trees bear a small white flower about April and probably belong to the species Blumea balsamifera. Camphor trees are also to be found in the Keng Hung panna of the Mong Han State in the Kengung division of the Chinese Shan States. Further, the plant known locally as pomathein, growing wild in the Karenni, central and Myelat divisions of the Southern Shan States, has been recognised by the Reporter on Economic Products to the Government of India as belonging to the species Blumea balsamifera. It is strange that neither the pomathein nor the species Cinnamomum camphora, yielding the ordinary Japan camphor, grow in Kengtung State in Burmese territory, but in that portion of the State near the Chinese frontier both species are fairly abundant. The mode of manufacture of camphor as practised in North Hsenwi is interesting. The leaves and thinner twigs are gathered, though mature leaves are preferred, and placed in a bamboo basket which is then put into a large pot containing water so that it is just above the water, and on top a chatty of cold water is placed. Fire is then applied. The steam from the water in the large pot passes through the basket and the cold water on top, which is frequently changed, acts as a condenser. In a few hours the operation is completed and on the leaves being removed the camphor is found adhering to the sides of the basket after the manner of salt. It is then scraped off and placed in bamboo tubes. The yield varies according to the quality and quantity of leaves used in the operation, but one or two rupees weight is usually the result of a single boiling. The camphor finds a ready market locally, as it is largely used as a medicine and it fetches about 2 annas for a rupee's weight. The trade in this commodity is insignificant at present, as the people only extract the camphor when they have nothing else to do.

The camphor tree of the species Blumea balsamifera seems to be indigenous to certain parts of Burma, and the experiments conducted by the Forest Department to cultivate the species Cinnamomum camphora show that this tree can be successfully grown in the Upper Chindwin, Myitkyina and Bhamo districts, as also at Momeik, while in Maymyo this tree is reported to be flourishing. The experiment with Cinnamomum camphora so far go to show that it can be successfully grown in Upper Burma, and the species should also do well at suitable elevations in the Shan States. There is, therefore, a very fair possibility of a camphor plantation on a commercial scale in Burma being successful and paying.—*Rangoon Gazette.*

MANURING CACAO.—(CACAO OR CHOCOLATE).

Manurial experiments have been carried out on cacao trees in

DOMINICA.

Considering the crop returns obtained during the past five years, the results show that the use of phosphates and potash on the first plot has increased the yield of dry cured cacao by an average of 219 lb. per acre per annum over the yield given by the unmanured plot. The use of the dried blood alone, primarily a nitrogenous manure, increased the return of cacao by 187 lb. while the combination of the two sets of manures, *i.e.*, phosphates, potash and dried blood, resulted in an average yield of 374 lb.

per acre per annum over and above that obtained from the unmanured plot. *The mulching gave the greatest gain of all, viz.*, 402 lb. in excess of the return from the unmanured plot. Dr Watts mentioned also that the cacao tress on the mulched plot are much finer and better developed than those on the other plots, and also that the soil of the mulched area is in exceptionally good physical condition. Although such good results have been obtained with mulching alone, Dr Watts pointed out that in many cases it will be well to supplement mulching with moderate applications of nitrogen and phospate. It is believed that potash is not urgently needed as a fertilising constituent in Dominica, as the soils of the island are fairly well supplied.

The results obtained with the experimental plots in the country districts show that manures are beneficial and remunerative in the establishment of young cacao, and that pen manure, when obtainable, is likely to give the best results.

Observation shows that good general results are likely to follow the intelligent use of the weeds growing in a cacao orchard. When the country experiment plots were first laid out in Dominica, attempts were made to keep weeds down thoroughly by a system of clean weeding. The soil showed signs of deterioration, but on altering the method of treatment, allowing the weeds to grow to a moderate height, and then cutlassing them down, or bedding them in with the fork, surprisingly good results followed.

Trinidad.

According to Dr. Barrett there is very little correct cultivation of cacao, as he understands it, in Trinidad. Great importance is attached by him to the danger of leaving black or brown, or otherwise diseased pods on the trees. These, it is claimed, breed spores by the million, any one of which was capable of carrying disease to the trees and in time killing them. Cement should not be used for filling holes as the wood leaves it, as ants, etc., get in and attack the wood. The best filler is clay and fibre, two parts of clay and one of soft, fine fibre ("barfleur" or cotton fibre) mixed with enough water, better still oil, and, preferably, resin oil, to make a nice paste, capable of being pressed into the hole of the tree. It is good to varnish the surface with a dressing of resin oil. The holes should be cleaned out carefully, and by an experienced hand, a 1 or 1½-inch gauge chisel being a good instrument to use. In clever hands the clearing out of the rotten wood could be done very quickly.

Grenada.

In Grenada the experiments in many cases were carried out on plots of about one acre in extent, chosen from land belonging to peasant proprietors, situated near the road. On these plots proprietors are shown how agricultural operations, such as forking, draining, and pruning should be carried out, and how manures should be applied. The results obtained were highly satisfactory. Two facts were specially apparent; (1) That on heavy red clay, as that met with in Grenada, the cacao responds quickly and liberally to applications of guano; (2) the pen manure, when applied in heavy dressings, and thoroughly and deeply forked in, is of considerable value. Manuring increased the crops during the four years under review:—

		Wet Cacao per plot
1903	No manure yielded	.. 759 lb.
do	With manures yielded	1,063 to 1,281 lb.
1904	No manure yielded	.. 548 lb.
do	With manures yielded	808 to 870 lb.
1905	No manure yielded	.. 673 lb.
do	With manures yielded	814 to 1,179 lb.
1906	No manure yielded	.. 748 lb.
do	With manures yielded	763 to 1,519 lb.

A table of the gains when using the proper manures (at any rate in Grenada) points out that in one case where manure of an unsuitable character was used, a loss £4 4s per acre was incurred, whilst in the best case a gain of £20 16s was obtained. This shows a difference of £25 per acre, though using the right and the wrong sort of manures. It therefore behoves one to well study the question before making a start. The gains from mulching of grass and leaves are described as being phenomenal. The mulch is applied once a year, it is spread evenly over the surface, and allowed to incorporate itself with the soil by natural agencies. It is not buried or forked into the soil, and the thickness of the mulch, even when freshly applied, rarely exceeds an inch.—*Journal of the Jamaica Agricultural Society* for April.

A TEA-CLEANING MACHINE.

This article describes a unique machine which was formerly used for grinding coffee, but which has been remodeled and fitted up for the cleaning of tea by a Hamilton, Canada, tea and coffee man. This machine holds about a chest of tea, and a half-hour's time is consumed in cleaning it. The owner says the cleaning makes the

tea much pleasanter to handle and that it has helped to increase his business.

H. B. Marshall, manager of the Marshall Tea Company, 191 King Street East, Hamilton, Canada, is the designer of the tea-cleaning machine shown in this connection. The machine occupies a space in the rear of the Marshall Tea Company's store. Into a hopper the tea is emptied from the chest on the platform above. The vibration of the running machine carries it down into the cylinder. The inside of this revolving cylinder is fitted with narrow shelves which carries the tea up as the cylinder revolves. As it drops from these shelves the dust is thoroughly stirred up. The centre part of the cylinder into which the feeding and suction pipes are run does not revolve. The part of the cylinder that revolves rests on four cogs. The electric suction fan is connected with the machine by pipe No. 2. Pipe No. 2 extends into the cylinder about 15 inches, and is cemented where the connection takes place on the inside, so that no tea can be sucked through the pipe. The upper side of the pipe inside the cylinder is oval, but the under side is flat and fitted with a wire sieve, through which the dust rises. This sieve is sufficiently fine to prevent all but the dirt and the very finest particles of tea going through. The edges extend about an inch below the sieve and flare slightly, the idea of this being to throw the tea off as it falls down over the pipe. It being natural for the dust to rise, the suction does the rest. The tea is emptied through the slide door of the cylinder, after being cleaned, into a box just below the hopper. Pipe No. 2 enters the fan, and a pipe carries the dust from the fan to the outside of the building. Mr. Marshall has perfected an arrangement to prevent the dust being blown directly into the air. By this means he is able to save the fine tea, and the rest finally blows away. He does not claim that this machine is perfect. He has found that the falling of the tea from the shelves breaks it to a certain extent, but does not grind it, as he at first feared it would. The machine holds a chest of tea conveniently, and it usually takes about half-an-hour to clean it. Mr. Marshall says that he has found that cleaning the tea makes a very noticeable difference. It is much pleasanter to handle and it is practically free from any floating dust or fibre. The amount of tea that is carried through the sieve is very small. When sufficient is collected, Mr. Marshall proposes to sell it to manufacturing druggists.—*Tea and Coffee Trade Journal* for April.

METHODS TO BE EMPLOYED AGAINST TERMES GESTROI, THE RUBBER PEST

The only chemical with which any degree of success has been obtained in other parts of the world [in dealing with *Termes Gestroi*] is Carbon Bisulphide. This insecticide is, however, most difficult to obtain in this country, and its prohibitive cost excludes its general use especially over any great area. Attention to remedial or rather preventative measures should, therefore, be directed elsewhere for the present. My own observations made on young estates have firmly convinced me that the only remunerative method to be employed against the ravages of *T. gestroi*, is to follow up their burrows and so ascertain the position of the nests. These as heretofore stated will be found either in or around buried stumps, or contained within the fallen trees lying on the surface of the ground. Such trees must be destroyed.

There are only a few native trees which are attacked and acquaintance should be made with these. The most important are Kumpas, Meranti and Pulai. On freshly felled land I would not advise the destruction of the Kumpas, Meranti, and Pulai trees in the first instance as they subsequently afford means of locating *T. gestroi* and should then be completely destroyed together with the ants. Trees lying on the ground are easily detected if attacked, and before doing away with these trees, the burrows leading away from them must be followed up and disturbed. This method would not require more coolies than are at present employed in making daily inspections of the rubber trees, and would, as has been shown, be far more effective, if not a final treatment.

Young trees which are attacked by *gestroi* and show no external signs of disease are often discovered by following the burrows of *T. gestroi* issuing from dead trees. Treating the former trees at an early stage of the disease, combined with destruction of the source of their infection is sufficient to prevent further attacks (at all events from the same source) and in all probability will save a considerable area becoming badly infected.

On the majority of estates in the F.M.S. a certain number of coolies have their work confined to repelling the attacks of *Termes gestroi*.

These coolies are, however, not aware that only one kind of Termite attacks rubber, nor are they acquainted with the burrows of this species,

That Tamil coolies are capable of distinguishing *T. gestroi* and its burrows has been proved to me at Kwala Selangor, for on explaining to them by a series of practical demonstrations the several differences, they were not only very clever in discovering the burrows and following them, but were able to recognise *T. gestroi* at a glance.

By far the most difficult question is to deal effectively with this serious pest in old estates. Here the roots of the large trees hinder coolies endeavouring to discover the burrows to such an extent as to place this method beyond practical use on estates with a heavy clay soil. In the lighter soils, however, I have found that the burrows may be satisfactorily followed. With old trees the method at present taken against the ravages of *T. gestroi* is to expose the roots and apply various poisons.

A LARGE SERIES OF EXPERIMENTS

were conducted in the Kuala Kangsa district on trees about 9 years old. The results of these experiments show it is only by systematically and persistently repelling the attacks of this insect that any measure of success can be attained. Where these experiments were conducted small localised areas were severely troubled with *T. gestroi*, and about 12 coolies were daily employed in examining the trees. Among many other insecticides tried were various mixtures of Kerosene applied to the roots and exterior of the tree, and on one occasion an application of kerosene emulsion made as follows repelled the attacks for nearly 6 weeks :—

Kerosene 1 gallon, water 1 gallon, soap ½ lb.

Boil the water and dissolve soap in this. While boiling hot add to Kerosene slowly, churning meanwhile; continue to mix thoroughly for at least 5 minutes. Dilute with 6 galls. water before using. This method, although the most satisfactory yet discovered, is not entirely satisfactory, as it tends to make those termites which escape, burrow into the interior of the tree by way of the unexposed roots, and further its application is not invariably successful. The fault usually lies in not removing sufficient earth from the roots. I would advise that the earth be removed within a five-foot radius, and to a depth varying proportionately with the depth to which the tap-root extends. A tree dealt with in the above manner naturally has its hold in the ground considerably weakened, and the roots should not be allowed to remain unexposed for more than a week, during which time a daily inspection must be made. Such a treatment must be immediately repeated if heavy rain falls soon after the mixture is applied. Hollow trees must be dealt with by boring into their trunks until the hollow portion is reached.

By way of the hole thus formed force six ounces of calcium carbide (the amount of course varies according to the age and condition of the tree, the amount suggested being the maximum) into the hollow portion ; close the entrance by means of a cork or cement and apply a little tar over the wound after it is stopped up. The advantage of a plug is that it is easily pulled out if the treatment has to be repeated. Coolies should not be allowed to remove the mud-encasements of *T. gestroi* with a stick or parang as they do not kill the ants and are liable to cut into the tree. A coconut brush or some such implement is far more effective if rubbed down the bark. Gales of wind are often the cause of trees splitting down the centre between two large branches, or branches are liable to break off. It is advisable in such cases to apply tar to the wound. Trees blown down by the wind must not be propped up, but destroyed. Those trees which have a tendency to fall should be supported in the side towards which they are leaning.

PATENT WHITE ANT MIXTURE.

There are several patent "White Ant" insecticides placed in the market here. Those which have been experimented with are "Street's liquid white ant cure," "Atlas preserver" and "Anticide."

A Lower Perak planter states he has obtained most satisfactory results with the former.

His method of application was precisely the same as mine (applied to the roots and outside of the trees) except that a larger variety of experiments were tried by me, and the strength of the "ant cure" was varied to a greater extent.

The results of my own experiments were not successful, for while the attacks were repelled for a few days, the termites returned as soon as the noxious elements of this insecticide had disappeared. It is a very corrosive mixture and must be applied with care if used, although its application I maintain is useless while the burrows remain undisturbed. The results obtained from "Atlas preserver" and "Anticide" (the latter is composed to a large extent of Cyanide) have not been favourable.

To the planting community in general from whom I have received generous assistance while investigating this disease, I would offer my thanks. To a few planters in particular my

thanks are especially due; but as the appearance of their names is usually taken to mean that their estates are the most affected, a public acknowledgment is undesirable.

H. E. PRATT.

—*Straits Agricultural Bulletin.*

TWO RUBBER PESTS.

In the Journal of the Federated Malay States Museums, Mr L Wray records two insects attacking Para Rubber, one a caterpillar and the other the troublesome beetle *Astychus chrysochloris*, formerly known as an enemy to Liberian Coffee of which it devoured the leaves.

The caterpillar is described thus:—"General colour above black, minutely spotted and lined with white, sides with a bright yellow waved line starting from just behind the third pair of legs and continuing to the tail. There are some conspicuous white spots on the shoulders and on the last segment but one of the body. Head and legs bright reddish brown, prolegs black largely spotted with pale reddish brown beneath black largely spotted with dull yellow. The largest specimen was some inch and a half long." The group to which the caterpillar belonged is not stated, presumably it was that of a Noctuid moth. The caterpillars were found to be numerous on secondary jungle near the rubber fields. They were destroyed by spraying with Paris Green in water.

H. N. R.

—*Straits Agricultural Bulletin*, for March.

A RUBBER ESTATE SURVEYOR FOR W. BORNEO.

The Extraordinary *Gazette* notifies the appointment of Mr E A Pavitt as Government Surveyor. The opening up of Rubber Estates on the West Coast during the past few years has involved a geat deal of survey work which the Land Department has been unable to cope with. Mr Pavitt, being now relieved of his Public Works duties, is to devote his time to the surveying of Estates boundaries. We hear that he will move his headquarters to Tenom.—*British North Borneo Herald*, May 1.

A NEW SCIENTIFIC USE FOR RUBBER.

To signal shallow water.

An ingenious device has been patented by a Japanese, Kozaburo Makimora, for the automatic signalling of shallow water. It consists briefly of an airtight rubber disc covering one end of an empty cylinder. This cylinder is weighted and towed by the ship at the end of a small armoured electric cable. The rubber is bulged in by the pressure of the water, but this is partly compensated for by the provision of a spiral spring inside the cylinder. When the ship approaches shallow water the apparatus drags along the sea bottom, and as the water pressure lessens, the balance between the force of the spiral spring pushing outwards and the force of the water pushing the rubber disc inwards becomes disturbed, and acting upon a simple mechanism, rings an electric bell upon the ship. The rubber disc is well protected by a perforated cap.

We are not sufficiently informed to say for certain whether the device is entirely practicable for merchant vessels steaming at considerable speed, but at any rate there should be a considerable scope for the invention upon survey vessels, ships in unknown waters, etc. —*India Rubber Journal*, April 20.

A RUBBER COMPANY FOR TONKIN.

120 PER CENT DIVIDEND IN 1917!

The prospectus has been issued in France of the Concessions Agricoles et Plantations De Caoutchouc Tartarin Soc. Anon., which, with a capital of frs. 600,000, proposes to take up the business of plantation proprietors in Central Tonquin. The net profit upon the vendor's working for 1907 was 57,000 frs. There are about 50,000 *ficus elastica* trees planted upon the estate, and it is expected that the following number of trees will be in bearing in the respective years, viz.: 200 in 1909, 800 in 1910, 2,300 in 1911, 6,000 in 1912, 10,500 in 1913, 18,500 in 1914, 28,000 in 1915, 38,000 in 1916, and 50,000 in 1917. The yield is calculated at 1.50 kilos. for the first year the tree come into bearing and 10 per cent. more for the following years. At this rate the crop for 1912 would be 9,495 kilos., for 1913 17,145 kilos., for 1914 30,720 kilos., for 1915 47,745 kilos., for 1916 66,945 kilos., and for 1917 90,645 kilos. This would admit of a 120 per cent. dividend in 1917 from the rubber alone. The profit for the first few years will have to be entirely derived from by-products. The provisional offices of the Company are at 102, Rue Nolle, Paris.—*India Rubber Journal*, May 4.

CEYLON TEA IN AMERICA.

REPORT FOR 1907.

By Mr Walter Courtney, Commissioner for Ceylon.

The work for 1907, while embodying in many ways continuation of that inaugurated in 1906, has nevertheless been different on account of one or two new features.

The first five months of the year were taken up with the work of bringing new firms to make a specialty of PURE CEYLON TEA, and at the bottom of this report I append a list of the names of those firms, together with those previously secured, and an estimated number of the retail grocers which the heads of the several firms assure me have taken up the sale of the TEA through them. The plan which we worked was as follows:—

After having induced a firm to put up a PURE CEYLON TEA packet of their own and being satisfied that the tea contained in it was of the very best quality, and one that carefully blended made it possible to easily match it again in the open market when required, I lent them one or more men as was necessary, to go round with their salesmen to as many as possible of the retail stores with whom they dealt, instructing them and giving them all possible assistance in order that they might have every opportunity of persuading the retailer of the benefit of taking such Tea, and the value that would accrue to him by stocking an article which was daily growing in public favour and which it behoved him to keep a supply of. It was necessary to do this missionary work; for it was naturally unfair to get a man to put out a new packet of his own and not give him all possible assistance in placing it before his trade and getting the necessary repeat orders which would enable him to get the profit he looked for. This of course required a great deal of work, as it is one thing to get a retailer to stock a new brand of Tea, and another thing to get him to send in repeat orders. In some cases where the Tea was a decided novelty and the retailers complained that their customers did not ask for it, we hit upon the plan of making a house-to-house canvass, engaging say twenty young women under one or more overseers, who went to each house in a certain district and tried to take orders for this Tea on the local grocer. If they met with a rebuff, they then asked permission to make a cup of Tea in order that they might demonstrate its superior quality to that being used in the house. This they were easily able to do, as each one carried a small bag with a teapot and some Tea and where they were allowed to make the Tea they had no difficulty in persuading the lady of the house to order it from her regular grocer. This resulted, of course, in the grocers in that district receiving several orders, and they were able to get rid of the Tea which they had bought from the wholesaler and send in repeat orders for a further supply. At every house so visited, they left a copy of the little booklet (enclosed) which I wrote and had printed, giving a few facts on Ceylon Tea and some half-dozen pictures of the industry, in order that they might have something to remind them of the visit. In this connection I send you a sample street map, showing you in how systematic a way this work was carried out, each young woman having to write a daily report in her book of the number of houses visited, the number of people who had given orders, total number of booklets distributed and the number of houses where she was allowed to make tea.

Before leaving for my trip to England on the 15th of June, I was able to arrange for

A LARGE DEMONSTRATION TO BE HELD IN WANAMAKER'S STORE IN PHILADELPHIA.

As Wanamaker had never allowed a demonstration of any sort there before, this was a great concession and one that we made the most of. It was carried on for a period of about six weeks during the summer, and the result of it was that the Tea which was demonstrated is now being sold in between sixteen or seventeen hundred stores throughout that city and district. Let me here give a brief outline of what was done, taken from a newspaper report:—

"A concession of some twelve hundred square feet on the main floor was obtained, which included the use of an immense show window permitting the free view of the exhibit from the street, and the exhibit thus installed was called the CEYLON TEA TOTAM. The demonstrators were costumed as nearly as possible like Tamil girls, and their quaint garb attracted much attention and questioning, in the satisfying of which CEYLON TEA was kept very much to the fore. The Tea was served by East Indians in Tamil costume, on lacquered Moradabad trays, and the Tea was made in new tilting teapots. This teapot, the happy invention of an English earl, has to be turned over on its back with its spout in the air while the tea is brewing, and as soon as the pot is turned right side up, the leaves are automatically drawn up out of the infusion, thus rendering, provided the water has been properly boiled, a good cup of tea a certainty. The china used was pure white, which showed off the rich colour of the Tea to advantage. Probably the best and most effective advertising during this time, however, was done by the Wanamaker store itself in its regular full-page advertisements appearing in all the Philadelphia papers each morning. In several cases pictures were used to illustrate the TEA TOTAM or some feature of the demonstration."

The reason we used the word TOTAM was because a great deal of importance is attached to a name in this country, and the mere fact of using one which nobody had heard before nor knew the meaning of, at once attracted general attention, and caused numerous people to come and see for themselves what on earth a TOTAM could be.—Advantage was also taken of the

BOSTON PURE FOOD SHOW

which is annually held in an enormous building known as the Mechanics' Building, and which attracts a great amount of interest and has been found to be the best

way to introduce the highest grade of articles to the trade and public combined. As you will see by the photographs, which have been sent you, we occupied the whole of the stage in this building and made it up to look as Eastern as possible. The walls were covered with Indian print hangings and the ceiling with cloths of various coloured stripes, while the proscenium was draped with a red cloth with the words

CEYLON TEA

in white letters fourteen feet high, which stood out and could be seen from any part of the building. Around the open part of the stage was erected a painted wooden wall to represent the wall around the

TEMPLE OF THE TOOTH

at Kandy, and the entrance to the stage was through an archway also made of wood and painted to represent the gateway of an old Sinhalese Temple, which was copied from an illustration. In the left hand corner was a little thatched bungalow, and beyond this at the back of the stage were two rooms which were used for preparing the tea in. The stage itself was covered with a number of small tables and stools, at which the people could sit and obtain free, as many cups as they wished, of what we did not hesitate to say was the finest tea in the world. Altogether we had twenty-nine women and girls making and serving the tea, and one of these who had rather an Eastern caste of countenance, was dressed up to represent a native girl, and so successful was her appearance, that she was almost invariably taken to be what the wily newspaper reporters declared she was, a real Singalee. In addition to these people, there were six real natives dressed in white duck native costume and gaily colourod turbans, who acted either in the same capacity as the girls, or else went out "into the byways and hedges and compelled them to come in," and so great an attraction did these men prove, that since the Commission's work has finished, they have been able to procure very satisfactory positions of one sort or another.

It was estimated by those who had charge of the Food Show that at least 250,000 people tasted a cup of PURE CEYLON TEA and by the amount of tea that was used there, I have no doubt that this was so.

As nearly everybody who visited the TEA TOTAM and tasted the tea, asked where they could procure exactly the same kind, which, by the by, they invariably declared they had never tasted the like of before, we hit upon the scheme of allowing them to fill in postcards in their own handwriting ordering their retail grocer to supply them with the tea, and, the cards being posted every evening, in this way the demand created was properly looked after. The highest number of cards written in any one day was no less than 581, which shows how much real interest was taken in the exhibit. In addition to all this, by doing a little advertising in the papers, the exhibit received an amount of reading matter during the month of the Food Show, the value of which has been computed, had it been necessary to pay for such copy, at $25,000. A scrap book containing those reading notices has been sent you. The actual result of this exhibit was that the tea is now being sold by rather more than 4,000 grocers throughout New England.

After the Food Show was over, and up to the end of February when the work of the Commission was brought to a close, numerous small demonstrations, embodying a miniature of the large exhibits above described, were arranged for in the leading department stores in several of the smaller cities in New England and the State of Pensylvania. These demonstrations have been very successful in stimulating the demand for PURE CEYLON TEA especially as they were carried on in an entirely different manner to any demonstration that has ever been held here before, as it was felt that it was necessary to get out of the rut and usual run which these things have been in for some time past, and that we were able to do this, the four or five letters which I send you from some of the department stores in question, amply testify. Mr. Doughty's work has been carried on in a very satisfactory manner, so that we now have the satisfaction of knowing that amongst the numerous hospitals and institutions which he visitod time and again, no less than 66 per cent of them are using CEYLON TEA in place of what they used before.

The work which Mr. Beling did was not only satisfactory but valuable, as it is commonly accepted as true, that even the people who handle tea in this country, really know very little about it, and a *real* tea blender is a *rara avis*.

It has been difficult to get hold of the true figures of the imports of CEYLON TEA into

NORTH AMERICA

for 1907, as no two authorities agree as to them. Taking, however, the returns received from Ceylon as to direct imports, and direct shipments *via* China, re-exports from the U. K., and transhipment from London as received from Messrs. Gow, Wilson & Stanton, as being correct, we get the following comparative tables for 1906-7 which show, considering the two adverse circumstances of the past year, namely the high price of tea and the financial stringency, a satisfactory increase, of practically a million pounds, over 1906. Both the causes above referred to naturally checked imports, owing to the fact that all stocks were practically used up in the hope that the price of tea would drop, which it did not, and also because no one wished for some months, when the panic was on and money was scarce, to do more than a hand-to-mouth trade.

COMPARATIVE TABLE.

	1906.	1907.
Direct Shipments from Colombo	13,138,306	12,575,858
,, ,, via China	2,064,662	1,986,918
Re-exports via U.K.	6,374,485	7,008,049
Transhipments	1,952,226	2,945,943
Total	23,529,679	24,516,768

The total number of lectures, given from the beginning of that work till its close yesterday, is 32, and the total number of people reached in this manner, was something over 18,000. It has been very satisfactory to me personally, to

note how successful these lectures have been, the result invariably being even more beneficial than my optimistic forecast. As I have not been able to dispose of the slides so far, I propose to keep them myself until I am able to do so, and give lectures whenever I have the opportunity.

There is a demand here (and shippers in Colombo cannot be too careful in paying attention to this fact) for all grades of really good Ceylon tea, but it is nothing but a waste of time and an untold detriment to the Island and its trade, to send here some of the rubbishy teas which one sees far too often in this market. You have an opportunity, and now is the moment to take advantage of it, remembering the famous lines,

> " There comes a tide in the affairs of men, which,
> " Taken at the flood, leads on to fortune."

WALTER COURTNEY.

Green Teas.

The position of and the demand for Ceylon Green Tea depends entirely on the basis of Japan Tea. If Japan Tea continues on its present high level, which has been existent now for the last eight months or so, with commonest kinds worth 18 cents on the New York market, then there is a considerable demand for Ceylon Greens of all Grades. But the general value of Government Standard Japan Tea has been very much lower in past years, ranging from 11 to 14 cents and in that case great difficulty arises in selling any quantity of Ceylon Greens. In Canada you can get as much for Hyson No. I as for Young Hyson, for there they do not seem to object to rough leaf teas provided the cup quality is right. On the other hand, in the United States there is great objection to roughness of leaf. Without doubt Canada has intentionally helped the sale of Ceylon Green Tea rather than that of Japan, though the same sentimental interest carries no weight in the United States. The demand for Ceylon Green Tea in New York and Boston, as far as first hands go, is for Young Hyson at 17 to 18 cents, good pale liquoring teas. We know of course that smaller buyers pay higher prices. I may mention that the price recently quoted here by Messrs.—— & Co. is 9 1/4d c.i.f., and that basis has kept a lot of people who generally carry Ceylon Young Hysons, completely out of the market. Unless you can keep Ceylon Greens down to a reasonably low level, that is from 17 to 18 cents for Young Hysons when good stocks would be held here, the market will be very limited indeed. Great care must be taken that the cup quality is up to standard; otherwise the teas will be rejected.

The Standards used for Ceylon Greens are Moyunes. Imperials for Gunpowders and Moyune Young Hyson for Ceylon Young Hyson. Strangely enough though Ceylon Greens come into competition principally with Japans, nevertheless Japans are not used as standards for Ceylon Greens. In all grades a pale liquor and one that will remain pale even when the teas have been left on the leaves for hours and are stone cold, is absolutely necessary. A good standard to go by is "Arapolakande ?" and to fall below this simply limits the demand at once.

WALTER COURTNEY.

CEYLON TEA IN EUROPE.

REPORT FOR 1907.

By Mr. J. H. Renton, Commissioner for Ceylon.

The tea trade on the Continent in 1907 has been slow. owing to the high prices ruling throughout the year for medium and common teas. As long as retailers do not see their way to raise their prices sales of good quality teas must be difficult. Notwithstanding the difficulties under which the vendors of Ceylon teas have laboured, I am convinced we have made good progress; though slow, it has been steady and sure, I have been particularly struck in my travels with the following three features :—

FIRST.—The greater prominence given to Ceylon Tea by the Retail Trade in their shops and shop windows. The situation is very different from what it was in 1901. Ceylon Tea was then practically unknown by name to the Retailer. When compelled through our campaign to keep pure Ceylon, or a blend containing some Ceylon as a substitute for the Real article, the Retailer still kept it in the background to be produced only when demanded. He now displays some kind of tea labelled conspicuously as Ceylon. This is more or less the case everywhere, but is most noticeable in

CENTRAL AND SOUTH GERMANY AND IN VIENNA.

I give two instances :—I had induced one importing firm to supply their clients with a facsimile of a double bullock cart for their shop-window, and another firm to furnish a figure of a tea plucker for the same purpose, the models for both of which had been obtained from Ceylon. But I was pleased to notice in Mr Schepler s window—the leading oilman-store shop in Frankfort,—a first rate life-size figure of a Malay woman with sarie, cumbly, basket and tea leaves and in another prominent shopkeeper's window in Stuttgart, I saw a plaster figure of a Tamil Tea plucker and also a wooden bullock cart. Neither of these two shops were furnished with these articles by our Agents, nor were they procured by them at our instance. They had obtained these models on their own initiative from their own suppliers. Beside those figures the windows contained a good display of Ceylon tea in packets, which on purchasing and tasting I found to be genuine.

SECOND.—The fact is that in all the good hotels, especially in Germany and the North of Europe, a much better class of tea is now provided. The taste for tarry Souchongs seems to have gone and blends with Indian and Ceylon have taken their place.

THIRD.—The Invasion of the Continent by the representatives of London firms was most marked last year.

All the vendors of Ceylon tea known to me have been

VISITED BY REPRESENTATIVES OF CITY FIRMS offering Ceylons, or Indians, or blends with China. A few of these travellers have—I am sorry to say—endeavoured to push their own special wares, by representing that Ceylons

were not suited to the Continental taste and that Indians or blends with Indian would do better. But it is gratifying to see English dealers alive to the fact that a trade has been opened for them on the Continent, and I am pleased to see that the well-known firm of Messrs. Brooke, Bond & Co. kindly acknowledge in their Annual Report that this trade is due to the persistent efforts and the sacrifices which the British Planter has made.

It is true the direct exports from Ceylon in 1907 are less than those in 1906, and this is the case specially in the exports to Germany, where the short-fall amounts to over 452,000 lb.—the total decrease for the year to all Europe, excluding Russia, being 670,363 lb. Complete figures for the Re export from Great Britain are not yet available, but as far as yet ascertained, they also show a small decrease. There is a small increase to Holland and France, but the decrease to Germany is 25,000 lb., and there is a decrease to the rest of Europe. Though there is a decrease in the Exports to Germany, the Customs returns show in the quantities cleared for consumption, an increase of 170,500 lb. of Ceylon Tea, and of 102,740 lb. of Indian Tea; and this, notwithstanding the fact that for 10 months of 1906 all teas imported from Great Britain were classified under their country of origin, whereas in 1907 the old system has been reverted to, of entering those teas exported from Great Britain as belonging to that country. And if we credit India and Ceylon with a third each of the quantity imported from Great Britain in 1907, the increase in each case will be an extra 80,000 to 90,000 lb. The total increase in the case of Ceylon must, therefore, be say, 260,000 lb. and in the case of India 190,000 lb. The consumption of Java and China sorts shows for the first time a decrease, which amounts to 36,000 and 299,640 lb. respectively.

The returns for the Custom clearances of other countries in Europe are not yet available. The DECREASE IN THE EXPORTS TO THE CONTINENT must be attributed to the high prices for medium and common teas, which formed so marked a feature in the second half of 1906. Dealers did not anticipate that the advance in price would be maintained throughout 1907. The orders passed direct to Ceylon were small and mostly at limits which prohibited their execution. Dealers anticipated a fall in price which never came, and the consequence has been a larger hand-to-mouth supply drawn from stocks in first hands. At the same time there has been an increase in the use of all the poorer sorts. In France, Annam Teas have been employed, and in the rest of the Continent China siftings, thus enabling the Retailer to sell his blends at the old price without loss.

The conscientious vendors of Ceylon teas have found competition very difficult to meet. They have not been able to raise their prices, as vendors of other sorts have not raised theirs. The plea that, as the first cost has increased, more should be paid, is of no avail, because the public have always been able to purchase so-called Ceylon Teas at the old rates from less scrupulous suppliers. This is especially the case in France; a glance at the figures giving the quantities cleared for home consumption will show how greatly the consumption of Annam tea has increased. In 1899—the year prior to the commencement of our campaign—the figures of consumption were as follows:—

From China direct	..	523,064 Kilos
,, British India	..	124 698 ,,
,, Annam	..	46,015 ,,

whereas the latest figures available (those for 1906) give the following:—

From China ..	Kilos 478,390,	being a decrease of 8 per cent
,, British India ..	,, 223,096,	an increase of 79 per cent.
,, Annam ..	,, 273,970,	an increase of 475 per cent.

It is the Propaganda in the interests of Ceylon tea which has mainly helped this enormous consumption of Annam. Little or no Annam tea is sold under its own name, while a still less quantity is sold pure.

In 1900 and 1901 the French Importers endeavoured to push

ANNAM TEA,

but owing to the wretched quality of the deliveries they were badly hit, and the principal firm in Havre, as well as the largest in Paris, assured me they would have no more to do with it. I suppose circumstances have been too strong for them, as owing to the cheapness of Annam tea, due to its poor quality and to the differential duty in its favour, they have been compelled to follow their competitors and to use Annam largely in their blends. The fact remains that Ceylon blended with Annam is sold all over France as Ceylon tea, and that Annam blended with China is also sold as Ceylon. The good name of Ceylon is being used to push Annam tea. The French public does not ask for Annam tea and does not know it as such.

It is therefore somewhat vexatious to see the efforts made by the French Authorities to discredit Ceylon in favour of Annam. I would call your attention to a paragraph which appeared in the "Illustration" of 18th January, being a quotation from a Report made to the "Académie des Sciences" by Monsier Dybouski. I quote the original as it appeared in the "Illustration":—

"Le bon thé de l'Indo-Chine possède un arome si delicat, qu'on lui fait subir un triage minutieux: les meilleures feuilles sont utilisées pour parfumer les thés de Chine et de Ceylan: seules les feuilles inférieures sont vendues sans mélange?"

The importance of this statement is evident when it is remembered that Monsieur Dybouski is L' Inspecteur-Général de L' Agriculture Coloniale and is an official of the Ministère des Colonies and "works," as the French say, "for his Parish." Immediately on the receipt of the paper containing the para. I caused a representation to be made to Monsieur Dybouski to the effect that his report was what Mr Churchill would call a "terminological inexactitude." He indignantly denied that he had said anything of the sort and protested, that he was not responsible for what a journalist might write. He admitted that he said in *France*, Annam teas were used to flavour Ceylon teas and referred me to his Report which has not yet been published. I have reasons to believe that the Report will be altered before being made public, but Monsieur Dybouski is convinced that Annam teas are much

better teas from a hygienic point of view than Ceylon, owing to the much smaller quantity of tannin which they contain and cites the opinions English doctors quoted in the English Press in favour of the milder China teas.

I believe Monsieur Dybouski's report is only the beginning of a campaign in favour of Annam teas and I hear that in the contracts for the services, the

GOVERNMENT NOW INSIST ON THE TEA BEING OF FRENCH ORIGIN.

Our expenditure in France ceased in 1907, but I feel it will be incumbent this year to spend a little money in the Press on refuting any paragraphs which may appear to the detriment of Ceylon tea and I am taking steps to do all that is possible to counteract the *too much tannin* bogey. It is the necessity of efforts such as these, which make me deplore the cessation of the Cess. I do think it a mistake not to have a small sum to fall back upon in case of need should improper methods be employed to decry Ceylon Tea. I enclose copy of a commercial traveller's report kindly placed at my disposal which shows what difficulties he has to contend with through the quantity of poor teas which are sold throughout France under the name of Ceylon. If all the Annam Teas were sold under their own name, I should not complain.

The consumption of Tea in

SWEDEN, NORWAY

and Denmark is almost stationary; but British grown teas are being more and more used, especially in Sweden and Norway. In France the consumption is growing, but almost imperceptibly. In Germany and Austria the increase of consumption is undoubtedly larger, but it is more noticeable in the liquid consumption of tea. Tea is much more drunk in Germany than it used to be, but as the teas now used are of stronger quality than formerly, they go further, and the consumption of dry tea increases but slowly. However, I feel it will not be long before Germany also becomes a larger consumer of tea.

As far as Propaganda is concerned my main work in 1907 has been confined to Germany. Work stopped in Norway and Sweden and Italy in 1906. In 1907 operations were closed in France and Belgium. A very small sum will be spent in Switzerland and Denmark this year, all work having practically stopped in these two countries in 1907. But with the sum placed at my disposal last year, I made a commencement in Roumania, where there is a good field, and I shall carry on the work in that country during 1908 and 1909.

IN GERMANY AND AUSTRIA

I have, to a large extent, followed the old lines, but far more money has been spent on the free distribution of samples with instructions how to make tea, which I believe to be the very best way possible to introduce our tea and to make it known. Special attention has been paid to displays in shop windows. The large firm in Viersen, with its 2,000 retail shops throughout Germany, has put a transparency in each of its shops—and elsewhere other importers have employed facsimiles of bullock carts, tea pluckers and tea bushes for window decorations. Illustrated circulars, price lists and show cards, street placards and advertisements in Newspapers and Magazines, have as usual formed part of the Propaganda work. The Tea Rooms in Berlin, Hanover, Frankfort, Stuttgart, Wiesbaden and the other special depôts in Düsseldorf, Hamburg, Dresden, Munich and Vienna—are all doing well. The support given to the Hanover depôt will cease this year and the proprietress will now run it on her own account. So far as Propaganda goes, it has been a success though it has not turned out a paying speculation for the owner as the starting of this special depôt has induced an influential firm of dealers to take up Ceylon Tea and sell it under a special brand of their own, so that in the Province of Hanover we have achieved our purpose, as Ceylon Tea is now on sale in 72 shops in the town, in 16 in the Province and can be had in 16 Hotels, Cafés and Restaurants in the town. It is true that in the cafés it is sold in glasses, is made very weak and is sometimes drunk with lemon or rum. I should immensely prefer to see it made stronger and served in tea-pots, but it is better to get Ceylon tea in somehow, in whatever fashion it may be served, than not to have it used at all.

The firms in Mulheim/Ruhr., Stettin, Breslau and one firm in Berlin have not done as well as in 1906, but a second firm has been secured in Dresden and new agents in Mannheim, while a second shop has been opened in Vienna and a new retail depôt in Munich. I am particularly pleased with what is being done in Vienna, Dresden, Munich and Stuttgart, Wiesbaden and Frankfort. I am disappointed that more has not been accomplished in Berlin. The work done by the Tea Room is quite satisfactory, but this is situated in Charlottenburg and our principal agent has, I fear, been too much occupied with the erection of large new central premises to devote much of his time to Tea last year. Now that his move into new premises has been accomplished, and as I have also got another firm in Berlin to take an interest in our tea, I trust we shall do better this year. The Frankfort Tea Room is very successful and is quite full in the afternoons from 4 to 6 o'clock The Wiesbaden business is the one that has so far been the most successful of all the special Ceylon depôts; the sale to hotels, pensions and cafés forms the prominent feature of its work. It is gratifying to learn of the numerous orders received from visitors, who after having left Wiesbaden, wish to continue drinking the same tea in their own homes.

I have taken no part in Exhibitions in Germany. Space in the Naval and Colonial Exhibition in Berlin was offered to me, but I considered the gain not by any means commensurate with the expenditure involved, and declined to support a special Ceylon show. As it turned out, the whole Exhibition as regards the attendance of visitors was a failure, owing to the abnormally wet and cold summer,

Lipton and the Indian Committee Each Made an Exhibit

which unfortunately involved the latter in a law suit. The authorities seem to have treated the Indian Committee badly. They were promised the sole right to sell tea and yot spaco for tea was sublet to others through another source and thus India's rights were disregarded. I am very glad, therefore, that I spent no money on this Exhibition.

This year I shall employ the special funds voted for 1908 in opening

An Energetic Campaign in Bohemia,

in carrying on the work in Roumania, where a capital beginning has been made by the Agents of a Colombo firm, in supporting the special Ceylon Tea Depôts in Germany and Austria and in erecting a tea room and making a Toa Exhibit at the Munich Exhibition of 1908. This promises to be a specially interesting Exhibition and will, I trust, be visited by strangers not only from Western but also from Eastern Europe. Since allotting tho funds for this year, a proposal to supply the tea department and tho employéos, and to establish a tea room in one of the new huge *Stores* to be opened shortly in Berlin, has been put before me. But I had already made my allotments for the year and as the scheme demanded support for five consecutive years I had no funds wherewith to carry it out, though I consider it a most desirable opening. This is another instance where if the cess were continued, funds might with advantage be made available for a special object.

The German Figures

of Customs clearances are as under :—

From :		1906. Kilos.		1907. Kilos.
Great Britain	(2 mos.)	17,300	(12 mos.)	109,300
British India		510,500		557,200
Ceylon		351,100		428,600
China		2,238,400		2,202,200
Japan		200		
Java		557,900		541,100
For use of ships and manufacture of Theine origin not given				37,800
Elsewhere		257,800		61,400
Total		3,933,200		3,937,600

The total increase in consumption of all teas in Germany since 1900 is 884,100 kilos or close on 2 million lb.

In Holland, a small sum has been given for Advertisements and Placards, Bill Posters and Circulars, and I shall continue the same amount in 1908 in order to meet the competition of the Indian campaign in this country.

In France all the same Agents have been employed as in the previous year with the exception of one—and most of the money has been spent in Advertisements for the local Grocers, in Circulars, Bill, Posters, Placards, and Illustrations, in presents to purchasers in large quantities and in Free Samples distributed by post. The Tea Rooms in the Place de la Prefecture, Marseilles, is the only one that has been assisted. This establishment does not confine itself to the sale of tea. To cover the heavy expenditure it is obliged to sell Coffee, Syrups, Liqueurs, etc., but tea is its prominent feature and it is well patronised by the best people in Marseilles.

In Denmark.

In Denmark, the principal firm has continued to spend a very large sum on advertising and general propaganda of which my contribution forms a very small part. In Denmark last year the quantity of tea imported from London was considerably above the average, whereas much less was bought in Ceylon, but on the whole sales were not up to the average, whereas in Sweden sales were much better, and a considerably larger quantity was imported.

I enclose for your information a copy of the Indian Commissioner's Report for 1906-07, kindly sent to me by Mr. Harington. You will see that his plan is quite different from what mine has been. The

Indian Tea Cess Funds

will be devoted to the establishment of one special Agency for the sale of Tea on the Continent. This Agency is to have its head depôt in Antwerp, to be managed by Mr. Harington, who intends to acquire sub-agents and branches throughout Europe. I, on the other hand, gave support to every firm or Importer who was willing to push and advertise Ceylon tea ; and as long as Ceylon tea was sold, no restrictions were made as to where it was procured, but each recipient had to provide at least two-thirds of the funds for propaganda from his own pocket—whereas the Indian people provide all the money for propaganda, but insist that their Agents shall buy their teas from their one, agency only. The policy may be a very good one, for it ensures the sale of specially selected Indian teas and will force other competitors to keep Indian teas; but I fear had I attempted such a plan, it would have laid me open to a charge of favouritism, and I think that on the whole mino was the better one for it gave me a command of much larger funds and a far large number of Agents all over the Continent. If, however, our plans are different, the methods of carrying them out are the same. Mr Harington works on the same lines that I have adopted : Demonstrations (during which tea is given away and sold in cup) Exhibitions, Distribution of Samples, and Advertising, and the erection of special Depôts for sale for the teas. He generously admits that India will profit much by our campaign. I feel quite certain that she will reap where we have sown, for Mr. Harington has told me personally that when interviewing Retailers and informing them that he has come to supply them with Indian teas, he has received the invariable reply : "Oh, you mean Ceylon !" which shows that Ceylon tea is known on the Continent to the General Public, whereas Indian is not,—as yet.

I wish the Indian campaign every success, but I only wish they had commenced at the same time as we, and had helped us to bear the burden and heat of the day from the commencement, instead of beginning when we leave off.

J. H. RENTON.

6th March, 1908.

BALANCE SHEET FOR 1907.

1907.	£	s.	d.	£	s.	d.
Jan. 1. To, Balance brought forward from 1906 ..	3,170	0	0			
Dec. 31. To, Remittances by 30 Committee Fo. 16 ..	7,0 0	0	0			
Dec. 31. To, Sundries (Exchange and Interest Fo. 159 ..	113	16	6			
By, Expenditure :—						
Dec. 31. In Belgium Fo. 88				20	0	0
Switzerland ,, 90				100	0	0
Denmark ,, 112				4 9	12	1
Holland ,, 145				82	3	11
Austria ,, 152				677	17	6
Sweden ,, 166				53	9	0
Germany ,, 168				4,932	15	5
France ,, 172				1,120	0	0
Roumania ,, 200				25	0	0
By Salary ..				300	0	0
,, Travelling expenses ..				250	0	0
,, Bank balances:						
National Bank of India ..	1,978	2	10			
Dresden Bank, Berlin ..	124	4	0			
Credit Lyonnais ..	146	11	9			
				2,248	18	7
	10,283	16	6	10,283	16	6

(Signed) J H RENTON, E. & O. E., 5th Feb., 1908.

I hereby certify that I have examined the books and vouchers and they agree in every respect.—(Signed) J A MORHAM, 5th February, 1908.

CEYLON TEA IN JAPAN AND AMERICA.

Dr. Hugh M Smith, Deputy Commissioner of the Bureau of Fisheries, United States Department of Commerce and Labour, on a visit to Ceylon speaking of Ceylon tea, said he had had it in Japan even in the small Japanese inns in remote places. He explained that the Japanese called it Ko Cha or red tea, as distinguished from their own green tea. Asked if he thought it was pure Ceylon tea, Dr. Smith said he thought it was the same tea as given in Ceylon.

"CEYLON TEA IN AMERICA."

MR. W. A. Courtney, the Ceylon Tea Commissioner, has contributed to a New York paper an article on "The Growth of Ceylon Tea." The title is misleading, for the subject dealt with is the growth of the American trade in Ceylon tea; but what Mr Courtney says is very much to the point.

Mr Courtney says a few words that may not be wholly palatable to American dealers in tea though there can be little doubt that he writes from knowledge. To some Americans "blending" appears to mean nothing more than the throwing of two or three different grades of tea together—mere mixing in fact. This idea Mr Courtney wisely seeks to dissipate. He is careful, however, to refer to another important point, and this is the impossibility of expecting that a blend composed of ten or more different grades can possibly have the same appearance as a straight tea... Perhaps, however, it would have been well if Mr Courtney had added a few words as to the

DIFFERENT TASTES AS TO THE FLAVOUR OF TEA

manifested by different communities, and the influence of the character of the water available at each particular centre of consumption. To urge the study of the water of each village would be too much; but in the large cities and towns of England this question of water has had to be studied very closely, and it is well known that a blend that will sell well because it produces a well-flavoured liquor when infused with local water in, say, Liverpool, will be unsuitable for, let us say, Birmingham or Glasgow. Idiosyncrasies of taste have, as we have indicated, also to be taken into account; but the great firms of tea-blenders in London and elsewhere do not omit to take the characteristics of each city's water-supply into consideration when preparing their blends, and some grocers in those cities study this matter perhaps still more carefully.

However, Ceylon tea has unquestionably been gaining favour among the people of the North American Continent. Planters have to consider whether the future development of this trade, that has prospered so well, can be safely left to the merits of their produce. Can the aid given in the way of advertising, and bonus-giving, and so on, be withdrawn without impairing the prospects of Ceylon Tea in America? Whatever Ceylon men may think, a very similar question has to be considered in respect to Indian tea. —*M. Mail*, May 25.

CEYLON TEA IN ROUMANIA.

Mr. Dinga, of the Roumanian Parliament, now in Ceylon, is to stay some weeks, tour, write a book for Roumanians and a paper to be read to the Bucharest Geographical Society on his return.

Ceylon tea, he says, has increased greatly in vogue in Roumania, imported *via* Russia. He adds that tea is sold in the markets, and some who boast of selling Ceylon tea alone actually sell other kinds. This, no doubt, has a bad effect on Ceylon tea. Other kinds were mixed with Ceylon tea and passed off as pure Ceylon tea. Others were benefiting at the expense of Ceylon. The best thing would be to establish a real agency; that would, he says, help Ceylon a good deal. Mr. Dinga is also interested in studying Ceylon precious stones; there is a market for them in Roumania.

TEA IN GERMANY.

[TO THE EDITOR, "INDIAN PLANTERS' GAZETTE."]

DEAR SIR,—I noticed from a late issue of the *H. & C. Gazette* that an "Indian tea house" has been opened the other day in Berlin, and that it was crowded by the public who thronged to inspect the "wonderous Orient within" consisting of Indian draperies, brass ware and rich Mirzapore carpets, scarlet and yellow uniformed Indian servants, serving the fragrant cup between bright pyramids of Indian tea. No doubt the endeavours of those connected with the above mentioned enterprise deserve every praise, but I doubt very much that the consumption of tea by the masses will be appreciably influenced thereby; and the calculation that the Germans could consume 360 million pounds of tea, provided their *per capita* consumption

equalled the English figure, seems to me to be somewhat visionary. A few inquisitive Berliners crowding a fashionably and orientally rigged-out room in a fashionable part of the town, will but slightly increase the use of tea by a nation which is wedded to coffee as a beverage. I noticed today, however, in my local paper, an order issued by the German army authorities, which will do more towards popularising the use of tea, than a thousand fashionable tea rooms could effect.

The German army being composed of all ranks and classes of the nation, the taste and use of tea will be carried into the remotest villages and hamlets by the time-expired soldier and the humbler classes will be taught that tea is a palatable beverage, not only to be used in case of illness, the latter idea being the prevalent one amongst the broad masses. The article referred to runs as follows :—

"The use of tea in the German army is to be encouraged still more than before by order of the Emperor.

"In many countries, especially those of the Guard regiments, tea has been regularly served for some time and is willingly drunk by the soldiers. The new field order supports the imperial endeavours in this direction by describing as desirable the serving out of tea, side by side with coffee, by the travelling field kitchens on long marches.

"According to the latest statistics, the tea consumption in Germany is very low, one-sixth of a lb. per head of the population against $6\frac{1}{2}$ lb in England, The tea producers and traders could hardly wish for a better propaganda than the Emperor's interest in the tea consumption of the army. Tho use of tea is bound to rise rapidly."

Hoping that the above will be of interest to you and your readers, I am, Sir, yours faithfully,

WALTER STIEFELHAGEN.

Wiesbaden, Germany, Alexandrastrasse 5, 28th April, 1908.—*I. P. Gazette*, May 23.

LEAF DISEASE SEIZES JAVA'S "COFFEE ROBUSTA."

Another sore disappointment has befallen coffee planters in Java. The so-called Java berry and the Liberia berry had both failed them from the ravages of leaf disease. Despair seized upon them until they heard that a new kind called Coffee Robusta, which thrived in Java, was proof against the ill. This vaunted sort displaced the old varieties on many estates, and the planters rejoiced. They have just received a rude awakening in that leaf disease has broken out on Robusta estates in Mid-Java.—*Straits Times*, May 15.

PRICKLY PEAR LEAVES A MOSQUITO PREVENTIVE.

The most important practical discovery in dealing with the mosquito nuisance since the action of kerosene was understood has been made by a French physician, M. Sanzeau de Puyberneau, who has found that the leaves of the common prickly pear if chopped up and thrown into water will prevent mosquitoes breeding in the water for weeks if not months. The resinous mucilage of the leaves floats on the water surface and chokes the breathing tubes of the mosquito. Further in stagnant fœtid water the prickly pear juice has the property of absorbing the gases of decomposition. It is most important that as extensive a trial as possible may be made of this new method of mosquito prevention in the Zanzibar Islands. The prickly pear is everywhere, and very little trouble is needed to chop up the leaves and drop the pieces into water, which formerly had to be repeatedly kerosined. —*Zanzibar Gazette*, April 29.

THE MANGOSTEEN FOR PANAMA.

Efforts are being made by the United States Department of Agriculture to introduce the cultivation of the mangosteen (*arcinia Mangostana*) into parts of the Panama Canal Zone, where the climate and soil conditions are suitable.—(*Bureau of Plant Industry Report, 1907*). —*Agricultural News*, April 18.

AGRICULTURE IN CEYLON.

(*From Mr. Slater's Blue Book Report for 1907.*)

(i.) The Ceylon Agricultural Society, founded in November, 1904, had at the end of 1907 a membership of 1,168 and 52 branches.

(ii.) The principle of co-operation has been adopted by more than one of the branch societies, seed and in some cases money being advanced by the local societies to their members at a low rate of interest. Important results are hoped for from the extension of this principle of co-operation and self-help.

(iii.) Agricultural Instructors are employed in making inspections and giving demonstrations in the villages. The utility of these officers has so far been demonstrated that the appointment of an additional Instructor is before the Board.

(iv.) Twelve successful Agri-Horticultural Shows were held during the year.

(v.) Cotton cultivation has been introduced into several Provinces, and attention has also been paid to tobacco and improved means of curing it.

(vi.) Other crops which have received special attention, particularly by the introduction of better varieties, are betel (Piper betel), yams (Dioscoreæ), chilli (Capsicum), orange, mango, sapodilla, durian and all varieties of vegetables.

(vii.) The development of the fibre industry and the introduction of suitable machine continue to receive attention.

(viii.) The extermination of pestiferous plants, such as illuk and prickly pear, has been carried out in different places.

(ix.) In connection with paddy cultivation, an effort has been made to encourage transplanting, judicious manuring and the employment of better seed as well as implements.

(x.) School gardens, which are doing excellent work, are being multiplied.

(xi.) Three additional experimental gardens were started during the year.

(xii.) The encouragement of sericulture has extended to the purchase of machinery for treating the cocoons of silkworms.

(xiii.) Bee-keeping makes steady progress.

(xiv.) The improvement of Stock is being kept well in view with the help of the Veterinary Surgeon and his Stock Inspectors.

COLOMBO TEA SALES.

AVERAGES FOR 1907.

BLACK TEA.

Estate.	Lb.	Av.
Monkswood	228,300	59
Ellawatte	45,300	58
Court Lodge	118,100	56
Denmark Hill	252,000	55
Tullybody	214,700	55
Glassaugh	212,900	54
Westward Ho	145,300	52
Pedro	225,100	52
Naseby	100,300	52
Mocha	223,500	51
Preston	108,600	51
Agra Ouvah	324,900	50
Ormidale	128,900	50
Bramley	194,500	50
St. Johns	189,200	50
Dovedale	45,800	50
Stafford	51,100	50
Glasgow	379,100	49
Tommagong	224,300	49
High Forest	672,500	49
North Cove	124,600	49
Palmerston	113,400	49
Callander	18,000	49
Attampittia	199,500	48
Seenagolla	55,200	48
Inverness	289,800	48
Middleton	121,100	48
Scrubs	120,700	48
Gampaha	366,300	48
Gonapatiya	222,000	48
Ragalla	28,600	48
Fetteresso	169,000	48
Strathspey	64,900	48
Midlothian	84,000	48
Bowella	85,100	48
Dotenagalla	109,700	48
Holbrook	19,800	48
Tientsin	45,800	48
Lynford	15,700	48
Cleveland	67,400	47
Killarney	146,500	47
Lucky Land	123,100	47
Ardlaw and Wishford	212,000	47
Ingestre	245,500	47
Queensland	112,500	47
Clarendon	116,000	47
Sudbury	58,100	47
Ladbroke	56,900	47
Gunville	21,300	47
Blinkbonnie	101,200	47
St. Evelyn	34,100	47
Annandale	84,700	47
Bunyan and Ovoca	133,800	47
Marigold	260,300	47
Highfields	298,400	47
Glenanore	128,900	47
Mossend	46,300	46
Brownlow	149,100	46
Logie	120,000	46
Gingran-Oya	109,400	46
Summer Hill	249,400	46
Devonford	86,700	46
Mansfield	118,300	46
Kincora	108,900	46
Robgill	117,900	46
Non Pareil	66,300	46
Waldemar	152,800	46
Ireby	111,600	46
Mincing Lane	36,300	46
Mt. Everest	91,500	46
Kolapatna	163,000	46
Yoxford	11,000	46
Waverley	15,400	46
Winwood	161,800	46
Warwick	10,200	46
Theresia	175,200	46
Cabin Ella	114,250	46
Battalgalla	160,400	46
Faithlie	86,400	46
Walla Valley	322,700	46
Wallaha	11,900	45
Coreen	149,500	45
St. Vigeans	75,000	45
Stamford Hill	1[illegible]9,700	45
Bickley	198,600	45
Camnethan	114,500	45
Invery	106,200	45
Harrow	150,800	45
Dotala	23,000	45
Agrakande	29,600	45
Tangakelly	26,100	45
El Teb	29,000	45
Mahagalla	36,300	45
Kinross	63,600	45
Munukettia	116,500	45
Warleigh	101,700	45
Dunnottar	76,700	45
Ambleside	55,700	45
Gonakelle	96,400	45
Grange Gardens	76,200	45
Simla	54,900	45
Kelaneiya and Braemar	140,000	45
Rookwood	350,300	44
New Valley	154,800	44
Nyanza	101,000	44
Bittacy	80,200	44
Moray	290,000	44
Maha Uva	306,900	44
Aldie	20,900	44
Hatton	86,300	44
Harrington	128,700	44
Adisham	118,300	44
Rookatenne	170,600	44
Bandara Eliya	609,000	44
St. Clair	458,000	44
Tymawr	279,900	44
Florence	258,000	44
Maha Eliya	152,200	44
Waitalawa	34,300	44
Tinioya	45,000	44
Nahavilla	154,600	44
Fairfield	22,700	44
Raxawa	36,400	44
Lameliere	228,000	44
Agra Elbedde	69,100	44
Meeriatenne	115,000	44
St. Leys	6,600	44
Frogmere	27,500	44
Gonavy	119,600	44
Rambodde	87,000	44
Mahagalle	87,000	44
Beauvais	75,500	44
Ury	52,600	44
North Pundaloya	20,100	44
Glenugie	26,200	44
Mt. Vernon	168,300	44
Templestowe	61,500	44
Galpitele	110,100	44
MonteChristo	123,900	44
Dambagastalawa	93,500	44
Glentilt	302,000	44
Oakwell	151,800	44
Avon	162,000	44
Rickarton	187,700	44
Verelapatna	346,800	44
Batgodde	33,400	44
Oonoogaloya	240,100	43
Rahatungoda	163,400	43
Evalgolla	112,000	43
Columbia	94,600	43
Newburgh	151,200	43
Mahatenne	51,700	43
Mahanilu	107,000	43
Haputale East	21,400	43
Avoca	53,000	43
Minna	25,000	43
Little Valley	72,400	43
Donside	21,800	43
Craigmore	56,600	43
Gangawatte	195,400	43
Ohiya	158,600	43
Dalhousie	10,500	43
Ritnageria	8,800	43
Coldstream Group	105,300	43
Tonacombe	303,300	43
Galapitakande	129,600	43
Westmoreland	136,600	43
Erlsmere	135,200	43
Dunbar	122,600	43
Siriwatte	12,100	43
Deaculla	147,800	43
Kirklees	234,500	43
Wanarajah	32,900	43
Hiralouvah	15,600	43
St. James	73,000	43
Myraganga	246,000	43
Ben Nevis	11,600	43
Whyddon	78,250	43
Hornsey	196,750	43
Templehurst	15,400	43
Vellai Oya	15,800	43
Galoolla	136,700	43
Blair Avon	55,400	43
Birnam	49,000	43
Panilkande	302,700	43
Oonanagalla	214,500	43
Choisy	241,000	42
Eastland	73,000	42
Glengariff	126,700	42
Muirburn	176,600	42
Donnybrook	95,300	42
Doonhinda	58,200	42
Delta	226,300	42
Roeberry	453,600	42
Madulkelle	82,200	42
Ampittigodde	68,000	42
Beverley	139,200	42
Ravenswood	31,900	42
Norton	21,800	42
Lyegrove	50,000	42
Gallaheria	120,900	42
Battawatte	258,340	42
Great Valley	272,100	42
Wellington	40,600	42
Ambagasdowe	12,600	42
Poolbank	16,900	42
Bambaragalla	7,000	42
Gwernet	34,000	42
Watumulle	41,200	42
Queenswood	38,300	42
Lonach	77,200	42
Swinton	161,300	42
Abergeldie	37,200	42
Glenfern	44,700	42
Carville	68,300	42
Hyde	93,600	42
Oonankande	56,000	42
Maryland	96,000	42
Kituldenia	151,200	42
Old Maddegama	97,200	42
Syston	8,000	42
Ravenscraig	61,500	42
Bopitiya	161,500	42
Pingarawa	42,500	42
Walton	100,700	42
Koslanda	178,700	42
Talgaswela	165,400	42
Mowbray	62,000	42
Meath	37,800	42
Queenstown	158,000	42
Hanagalla	229,600	42
Opalgalla	172,200	42
Harangalla	283,800	42
Chapelton	20,300	42
Nikkakotua	16,900	42
Ottery	221,800	42
Uvakellie	234,600	42
Yahalatenne	360,800	41
Dunkeld	195,700	41
Nillomally	114,800	41
Pattipolla	85,000	41
Bullugolla	259,400	41
Bowlana	96,500	41
Sylvakandy	416,200	41
Baddegama	102,300	41
Gallinda	65,100	41
Penrhos	212,100	41
Wattagalla	227,500	41
Nadoo Totam	146,000	41
Yelverton	104,300	41
St Heliers	127,800	41
Panmure	118,500	41
Orion	75,200	41
Hallowella	106,200	41
Strathdon	49,700	41
Abbotsford	44,000	41
Errollwood	61,000	41

Estate.	Lb.	Av.
Marlborough	143,800	41
Hardenhuish	77,000	41
Rondura	72,700	41
Passara Group	246304	41
Elemane	154,600	41
Stubton	47,100	41
Massena	59,600	41
Dickapitiya	109,000	41
Thedden	42,100	41
Dambagolla	23,500	41
Elchico	49,800	41
Old Haloya	30,600	41
Avondale	15,400	41
Bowhill	56,700	41
Dangan	24,800	41
Ballacadua	17,800	41
Wallawe	141,300	41
Shawlands	250,000	41
Deniyaya	149,800	41
Dumbugodde	168,600	41
St. Andrews	24,600	41
Nugagalla	103,000	41
Doonevale	41,000	41
Manickwatte	97,000	41
Buttukande	8,400	41
Harrisland	17,800	41
Demoderawatte	78,600	41
Widworthy	65,200	41
Laxapanagalla	191,800	41
Hauteville	40,900	41
Darrawella	28,600	41
Weygalla	84,500	41
Hyndford	114,800	41
Fairlawn	204,800	41
Coventry	72,600	41
Mawatura	32,500	41
Ferndale	15,600	41
Hangranoya	127,600	41
Deemaya	92,200	41
Mahalla	33,300	41
Kandahena	129,500	41
Castlereagh	207,800	41
Unugalla	188,200	40
Bollagalla	80,400	40
Mossville	300,500	40
Natuwakelle	30,900	40
Heatherton	76,900	40
Damblagolla	70,200	40
Tunisgalla	145,200	40
Gona	188,700	40
Glencorse	172,900	40
Ingeriya	121,600	40
Agratenne	105,000	40
Theberton	49,200	40
Suduganga	70,700	40
New Rasagalla	40,600	40
St. John Del Rey	33,700	40
Agra Oya	64,800	40
Tembiligalla	158,900	40
Galaha	49,800	40
Owilikande	112,000	40
Ferriby	113,200	40
Pindenioya	90,100	40
Ardross	63,200	40
Anniewatte	22,400	40
Oolawatte	22,200	40
Waitalawa	115,300	40
Macaldenia	141,500	40
Knuckles Group	24,200	40
Putupaula	37,800	40
Halugalla	95,100	40
Looloowatte	47,100	40
Adawatte	22,100	40
Nakiadeniya	250,700	40
Letchmey	87,800	40
Mousa Eliya	128,000	40
Glen Esk	83,800	40
Clyde	210,000	40
Wella	89,400	40
Unugalla	188,200	40
Ninfield	83,100	40
Patiagama	40,800	40
Kumaradola	40,000	40
Kandaloya	195,800	40
New Peacock	43,000	40
Andiatenne	70,000	40
Dromoland	83,400	40
Cotta	132,000	40
Kehlgama	87,000	40
Pansalatenne	205,800	40
Glendon	154,400	40
Good Hope	142,100	40
Dammeria	288,600	40
Arnhall	80,200	40
Wyamita	23,300	40
Kehelwatte	222,900	40
Perth	18,700	40
Medenham	45,100	40
Farnham	83,000	40
Waragalande	121,700	40
Tavalamtenna	107.400	40
Berry Hill	12,200	40
King's Grange	159,000	40
Warakamure	198,000	40
Dambagolla	23,500	40
Neuchatel	187,300	40
Neboda	268,600	40
Meddegodde	67,900	40
Oodoowera	105,200	40
Anning Kande	68,700	40
Murraythwaite	61,600	40
Ormondale	50,100	40
Ilex	75,500	40
Kebbekaduwa	62,200	40
Galenne	14,200	40
Galata	145,000	40
Torrington	31,400	39
Mabopitiya	66.500	39
Augusta	33,000	39
Polgahakande	60,300	39
Glenalmond	35,700	39
Gadadessa	11,700	39
Vendoola	14,300	39
Sirikandura	112,500	39
Dikmukalana	40,700	39
Allingford	74,600	39
Pen-y-lan	15,000	39
Kosgalla	20,100	39
Labugama	46,200	39
Narangoda	110,200	39
Glenalla	94,100	39
Kiriporuwa	170,800	39
Hatherleigh	137,900	39
Battakelle	37,800	39
Taprobane	54,200	39
Gangwarily	129,100	39
Hathmathe	57,600	39
Paniyakande	63,700	39
Leangapella	104,800	39
Hagalla	100,000	39
Katugastota	40,000	39
Eadella	70,000	39
Deviturai	155,800	39
Tempo	226,900	39
Taunton	104,100	39
Craigingilt	80,100	39
Nellicollaywatte	76,000	39
Matale	70,900	39
Poonagalla	164,000	39
Freds Ruhe	68,300	39
Kotagaloya	51,400	39
Edward Hill	168,500	39
Yataderia	300,000	39
Gyantse Valley	80,900	39
Girindi Ella	17,200	39
Hayes	236,500	39
Polatagama	60,100	39
Erracht	191,800	39
Vogan	516,400	39
K. W. P.	186,500	39
Dehiowita	44,800	39
Weoya	76,600	39
Knavesmire	310,700	39
Igalkande	91,500	39
Clunes	189,900	39
Ganapalla	259,300	39
Puspone	167,000	39
Borugala	34,500	39
Nugahena	77,200	39
Ambragalla	443,000	39
Rugby	37,400	39
Rosemont	68,500	39
Dea Ella	62,400	39
Banbury	72,100	39
Geragama	459,900	39
Yahalakelle	160,000	39
Millewa	178,300	39
Parusella	127,900	39
Carney	35,000	39
Beausejour	75,000	39
Hapugahalande	204,000	39
Stonyhurst	159,000	39
Citrus	204,000	39
Wiharagama	10,700	39
Newmarket	22,300	39
Kitulgalla	139,500	39
Troup	15,900	39
Avisawella	312,300	39
Tismoda	239,900	39
Agars Land	37,100	39
Hantane	244,400	39
Headington	21,600	39
Orwell	107,800	39
Siriniwasa	141,600	39
Stranraer	29,800	39
Goolshane	34,700	39
Katooloya	14,000	39
Maha Oya	16,600	39
Mousakanda	75,600	39
St. Helens	51,200	39
Dullawa	24,800	39
Mary Hill	68,800	39
Salawe	84,200	38
Ambalawa	114,500	38
New Angamana	156,800	38
Kintyre	23,000	38
Mariawatte	21,000	38
Horagalla	24,000	38
Raven Oya	25,000	38
Longville	89,000	38
Atgalla	29,100	38
Candawatte	23,000	38
Lavant	94,000	38
Dodantella	46,000	38
Walahanduwa	69,500	38
Karawanella	77,900	38
Aludeniya	27,500	38
Purana	34,200	38
Walpita	121,000	38
Laurawatte	151,000	38
St. Martins	39,600	38
Yellangowry	109,700	38
Shrubs Hill	241,700	38
Balantota	117,800	38
Ingrogalla	116,600	38
Kelani	291,400	38
Ruanwella	205,400	38
The Rubber Plantation, Ltd.	28,800	38
Pallagodde	342,800	38
Tellisford	16,300	38
Huluganga	18,600	38
Atherton	82,000	38
Ettapolla	17,800	38
Charlie Hill	51,800	38
Danawkande	13,200	38
Awliscombe	15,900	38
Kuruwita	31,800	38
Lyndale	22,300	38
Gamrie	19,000	38
Talcotta	10,500	38
Meddakande	23,000	38
Yataderia	299,800	38
Arslena	9,600	38
Puspone	21,900	38
Panville	10,200	38
Moragalla	41,500	38
Lantern Hill	151,500	38
Yatadola	39,200	38
Morahela	161,900	38
Maldeniya	185,800	38
Dalukoya	67,400	38
Havilland	156,900	38
Nargalla	22,900	38
Lauderdale	9,200	38
Alpha	63,200	38
Hopewell	30,200	38
Kudaganga	25,700	38
Kahatagalla	9,000	38
Hadley	22,200	37
Horagoda	17,800	37
Halbarawa	92,200	37
Selvawatta	35,200	37
Pinneduwa	34,000	37
Wepalla	8,500	37
Alpitakande	211,200	37
Embilia Oya	71,400	37
Marakona	14,600	37
Goyamboda	31,200	37

Estate.	Lb.	Av.
Trafalgar	160,300	37
Laxapana	12,300	37
Watawella	20,100	37
Hatale	25,000	37
Kalugalla	69,100	37
Morandukande	28,900	37
Tokatiamulle	16,800	37
Eila	248,100	37
Kurulugalla	85,300	37
Karagahatenne	58,800	37
Nambapana	42,700	37
Nahalma	182,000	37
Wekande	104,400	37
Ederapolla	81,000	37
Ankande	64,100	37
Kannatotta	16,500	37
Uragalla	12,600	37
Bridstowe	79,600	37
Glassel	13,520	37
Hillside	39,700	37
Munangalla	25,600	37
Wewewatte	29,700	37
Roopoosena	13,800	37
Torwood	189,300	37
Oxford	125,600	37
Mahawale	480,000	37
Talcotta	10,500	37
Morton	70,500	37
Higham	131,400	37
Lyndhurst	86,300	37
Hentleys	26,700	37
Bloom Park	35,500	37
Monrovia	98,000	37
Elston	330,000	37
California	7,800	37
Poilakanda	313,000	37
Sapu	23,700	37
Munangalla	55,600	37
Balado	104 900	37
Depedene	70,200	37
Mipitikande	35,300	37
Aranayake	58,500	37
Bodava	18,800	37
Mount Temple	293,500	37
Dover	161,000	37
Cooroondoowatte	132,700	37
Jak Tree Hill	111,900	37
Helvetia	85,000	37
Lorne	9,200	36
North Matale	17,400	36
Horagalakande	34,200	36
Muendeniya	329,400	36
Looleccondera	22,000	36
Gabbela	17,200	36
Sunnycroft	63,000	36
Mudamana	16,800	36
Hapugastenne	110,500	36
Horamulla	22,200	36
Alver	24,200	36
Gonnamadie	19,100	36

Estate.	Lb.	Av.
Hapugasmulla	30,200	36
Culloden	43,900	36
Halgolle	28,000	36
Atale	41,800	36
Labuduwa	24,000	36
Katukurundugoda	29,000	36
Dimbula Eliya	18,900	36
Kalupahana	31,500	36
Karawkettia	17,500	36
Lower Kanake	7,100	36
Southend	24,600	36
Silverton	19,800	36
Ellawalla	39,000	36
Kitool	8,700	36
Semidale	228,900	36
Taldua	124,600	36
Bellongalla	153,600	36
Bogahagodawatte	43,400	36
Yatiyana	30,200	35
Galatura	35,600	35
Horagaskelle	11,300	35
Ingoya	26,700	35
Moragahanga	31,000	35
Eilandhu	18,000	35
Rothes	11,400	35
Primston	17,800	35
Carolina	24,600	35
Florida	57,400	35
Kahabiliyagoda	12,400	35
Talawitiya	9,500	35
Zion Hill	22,100	34
Welikanda	17,400	34
Barrington	12,500	34
Roumania	43,350	34
Wiesbaden	13,750	34
Kekiriskande	10,500	34
New Peradeniya	43,600	34
Trewardena	18,200	34
Orangefield	41,700	34
Chesterford	37,600	34
Sadamulla	8,800	33
Hatdowa	38,500	33
Forest Creek	44,000	33
Enagalla	22,800	33
Allakolla	11,600	33
Morantenne	9,600	33
Arangoda	50,300	33
Talawa	22,400	32
Evalgolla	18,300	32
Lochnagar	129,400	32
Kempitiya	36,400	32
Manangoda	9,500	32
Roselight	12,400	31
Lebanon Gr'up	30,400	31
Lyndphele	31,500	30
Wewelkande	51,400	30
Boralugoda	12,400	30
Kabragalla	53,600	29
Bellamulla	33,400	28
Avington	15,000	23

Green Tea.

Estate.	Lbs	Av.	Estate.	Lbs	Av
Ooloowatte	25,500	45	Madampe	16,300	22
Vincit	77,800	38			

Indian Tea.

Estate.	Lb.	Av.	Estate.	Av..	Lb
Devicolam	165,800	48	Nullatanni	115,600	41
Chittavurrai	140,800	47	Surianalle	369,700	41
Mt. Gordon	32,600	46	Munnar	135,800	40
Vagavurrai	120,800	46	Karadi Shala	20,000	40
Sothuparrai	214,600	45	Bonami	24,800	39
Periavurrai	85,600	45	Lockhart	194,700	39
Madupatty	271,800	45	Askern	24,800	38
Yellapatty	24,700	45	Koliekanum	49,600	38
Gundumally	31,000	45	Mount	47,000	37
Kanniamallay	632,000	44	Stagbrook	18,200	37
Sevenmallay	144,800	44	Munjamallay	18,000	35
Pambanar	16,000	42	Bon Accord	13,000	33
Kalaar	65,000	42			

Monkswood retains the place of honour which it secured in the two previous years, having earned the highest average of 59 cents, tor a quantity of 228,300 lb. Ellawatte has taken second place with an average of 58 cents, for a quantity of 45,300 lb. This quantity consisted largely of dust and fannings, which fetched high prices last year. This estate, we find, sold 119,000 lb in London at an average of 9⅛d. Court Lodge has the same average and place; but with over five times the quantity sold in 1906. Denmark Hill from the eleventh has gone up to fourth place with an average of 55 cents and Tullybody from the eighth to the fifth with an average of 55 cents. Glassaugh, which held the second place for two successive years in 1905 and 1906, retains the same place, but with an average of one cent more on a quantity of 212,900 lb. Westward Ho from sixteenth has come up to seventh. Tomagong from second place recedes to the twentieth; St. John's has gone down to the fifteenth and Naseby to the ninth; Hanteville and Galaha have earned an average of 41 and 40 cents respectively by the sale of only dust and fannings—the average for Galaha in London being 7¼d and for Hauteville 8 5-8d. The largest quantity sold by one estate was 672,500 lb by High Forest, with an average of 49 cents. The other estates which sold large quantities were Bandara Eliya, 609,000 lb; Vogan, 516,000 lb; Mahawela, 480,000 lb; Geragama, 459,900 lb; St. Clair 458,000 lb; Roeberry, 453,600 lb; Ambragalla, 443,000 lb; Sylvakandy, 416,200 lb; Glasgow, 379,100 lb; and Agrah Ouvah, 324,900 lb.

High Grown.

	'98.	'99.	'00.	'01.	'02.	'03.	'04.	'05.	'06.	'07.
	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.
Tommagong	—	—	—	—	—	55	58	54	56	49
Naseby	58	51	52	59	56	—	47	54	53	52
Monkswood	52	51	55	54	54	51	50	56	58	59
St. John's	55	57	53	51	47	47	46	48	55	50
Agra Ouvah	52	51	48	47	48	50	46	49	48	50
High Forest	49	50	59	46	43	52	45	48	45	49
Glasgow	50	51	45	46	45	48	43	43	46	49
Harrington	45	47	41	—	—	48	45	47	47	44
Mocha	46	50	52	45	45	49	49	48	45	51
Dunbar	42	49	47	45	42	43	38	37	40	43
Middleton	47	51	45	44	42	51	45	49	47	48
Queensland	43	42	42	40	44	45	42	44	43	47
Glentilt	47	45	41	40	43	48	43	43	42	44
Tem'stowe	38	42	40	36	40	43	36	33	37	44
Castlereagh	40	42	39	39	39	42	37	35	38	41
Tonacombe	43	44	40	38	36	39	39	36	34	43
Dunkeld	40	43	39	37	36	41	37	35	37	41
Great Valley	34	42	36	36	34	38	36	33	38	42
Maha Uva	42	43	38	35	36	40	39	41	42	44
Deaculla	40	43	37	35	35	38	36	33	38	43
Dammeria	38	42	35	35	34	35	33	32	33	40
St. Heliers	36	39	37	34	38	41	35	31	35	41
Macald'nya	38	39	34	34	36	39	35	39	33	40
Dickapitiya	37	40	35	32	34	35	32	27	33	41
Harrang'la	34	37	30	30	30	34	34	31	35	42

LOW GROWN.

	'98.	'99.	'00.	'01.	'02.	'03.	'04.	'05.	'06.	'07
	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.
Weoya	30	34	30	34	30	35	—	—	32	39
Glencorse	32	38	32	33	32	37	37	30	32	40
Vogan	34	38	32	32	34	37	36	32	32	39
Kelani	37	37	31	31	33	36	32	27	30	38
Farnham	38	37	32	30	31	34	—	37	30	40
Knavesmire	32	38	30	30	29	35	—	33	33	39
Polatagama	32	37	28	30	31	36	34	23	31	39
Ganapalla	30	36	31	29	30	37	31	28	28	39
Torwood	32	38	31	29	28	34	33	29	31	—
Talagasw'la	35	35	31	29	31	38	34	34	34	42
Clunes	33	36	29	28	29	35	29	28	29	39
Hatdowa	31	34	29	26	27	33	28	25	23	33
Eila	32	36	28	25	29	31	31	26	29	37

—Local "Times," April 30th and May 1st.

FORMIC ACID AS A COAGULANT FOR THE LATEX OF HEVEA BRASILIENSIS (PARA RUBBER.)

BY DR. D. SPENCE.

Although the number of substances which have been tried experimentally as coagulants for the latex secretion of rubber-producing plants is legion, comparatively few of these have ever been employed to any extent on an industrial scale, and the number of reagents now in actual use on rubber plantations in connection with the coagulation of the latex is limited to one or two well-known chemical products which have found favour in virtue of the fact that by their use large quantities of latex can be coagulated in a comparatively short space of time, without diminishing appreciably the quality of the resulting product.

It is unnecessary to enumerate here the various chemicals which are still in use for the coagulation of rubber latices in different parts of the world. Acetic acid alone or in combination with alcoholic creosote is now extensively employed on various rubber estates in some parts of the world (in Ceylon and in F. M. S. in particular). In connection with the latex from Hevea brasiliensis acetic acid has been found to exert an accelerating influence in the process of coagulation of the latex. Minute quantities of the acid are sufficient in order to produce rapid coagulation, and by the use of this acid in such quantities the value of the resulting product does not appear to be appreciably diminished.

There is, however, another acid belonging to the same series as acetic, and it is to this that I should like to draw attention in the following communication. This acid has grown into commercial significance within recent years on account of improved methods for its preparation, and it has been shown to have, in addition to the general properties of the acids of its series, another valuable property which acetic acid and the others do not possess. This acid is formic, the lowest member of the homologous series, Cn H2n × 1COOH, to which acetic acid belongs. Formic acid shows all the general reactions of the group, but, in addition, is known to have very marked antiseptic properties. Until recently this acid was comparatively expensive, and its use in industrial processes was limited probably on this account, but with the discovery of simpler methods of preparation, the acid can now be turned out, I believe, in large quantities at a moderate cost, so that it is no longer to be looked upon as a chemical of scientific interest only.

Formic acid is a much stronger acid than acetic, and belonging as it does to the same series as acetic, I decided that it would be of interest to try it as a coagulant for the latex of Hevea brasiliensis, and to compare its action with that of acetic in this connection.

The work of Victor Henri on the coagulation of the latex of Hevea brasiliensis having shown that coagulation of the latex emulsion by acids is due to an increase in the H-ion concentration in the system brought about by the acid, one would expect, therefore, that an aqueous solution of formic acid should be many times more active in bringing about coagulation of Hevea latex than a solution of acetic acid of the same percentage strength. This I have actually found it to be, so that weight for weight formic acid is much more economical than acetic for the coagulation of the latex from Hevea brasiliensis. Nor is the fact that formic acid in small quantities in raw rubber has actually marked antiseptic properties of minor importance when considering problems in regard to coagulation. This acid would appear to be well worth the attention of those who have so far placed their faith in the better known, but less active, acetic acid.....

[We omit the technical details of the experiments, and give Dr. Spence's conclusions:—]

The rubber obtained by coagulating with formic acid was in no way inferior in physical properties or in chemical composition to the products obtained by using acetic acid as coagulant.

To test whether the formic acid used in coagulating the latex has antiseptic properties in the raw rubber, several samples of the raw unwashed product obtained by coagulating the latex in the above-mentioned way were exposed to conditions under which decomposition or putrefaction would be liable to take place in absence of a preservative agent. The formic acid product was left exposed for many months, alone and in immediate contact with mouldy samples of a West African rubber in which considerable decomposition had taken place. These tests were carried out in the air at the ordinary temperature and in the incubator at 37° C. After exposure under these conditions for several months the formic acid rubber had become considerably drier, but showed not the slightest signs of tackiness, mould, putrefaction or the like. Formic acid would appear, therefore, to have the property of preserving moist unwashed samples of raw rubber from decomposition.

In conclusion, a quantity of latex was coagulated by means of 10 per cent formic acid solution in 50 per cent alcohol and an equal quantity of the same latex by the necessary amount of a 10 per cent acetic acid solution in 50 per cent

alcohol containing, however, 5 per cent of creosote. The amount of acetic acid-creosote solution required was again considerably in excess of the formic acid used. The rubber which separated was filtered off in each case, worked up by pressure, while one portion of each was washed on the rubber washer, dried and analysed, while tho other was examined in regard to physical and other properties.

It was found that both the formic acid and the acetic acid-creosote products in the raw state and with about 8 per cent of moisture were quite alike in physical qualities, "nerve" strength, etc., while neither the one or the other showed tho slightest tendency to decomposition, tackiness, etc., when left exposed to conditions favourable to such changes.

On analysis the following results were obtained :—

Analyses.	1. Product prepared from Hevea brasiliensis latex by means of 10 per cent. Formic acid (yield 27.55 per cent.)	2. Product prepared from Hevoa latex by means of 10 per cent. Acetic acid with 5 per cent Creosote (yield 27.51 per cent.)
Caoutchouc	94.21 per cent.	92.51 per cent.
Resins	2.47 do	2.26 do
Nitrogen	0.657 do	0.61 do
(as protein)	4.11 do	3.81 do
Ash	0.185 do	0.199 do
Insoluble	3.45 do	4.68 do

These figures show that as regards composition the product prepared by means of formic acid is quite as good as that prepared by means of acetic acid and creosote. The formic acid product was of a perfectly clear pale-yellow colour in the dry state, the acetic acid-creosote product being dark-brown in colour. As regards "nerve," or resiliency, both products were alike and neither showed any signs of tackiness on keeping.

In conclusion, these results serve to show that where the latex of Hevea brasiliensis has to be coagulated rapidly in bulk formic acid may be omployed with advantage in place of acetic acid. Furthermore, it would appear to havo the following advantages over acetic acid :—

(a) Much less formic acid than acetic acid is required ; formic acid having more than double the value of acetic as a coagulant, is more economical from a practical point.

(b) Formic acid is of marked value as an antiseptic agent, preserving the raw moist samples of rubber prepared by moans of it from putrefaction and decomposition. It would appear, indeed, that in this connection formic acid combines tho properties of acetic acid and creosote, and could be employed, therefore, with advantage where coagulatiion by means of ascetic acid and creosote is indicated (moist block rubber.)

In combination with centrifugal processes, formic acid gave excellent results When the latex of Hevea was first just acidified with this acid and then centrifugalised, complete separation of the particles of rubber was brought about within a few minutes. In separating Hevea latex by means of the Michie-Golledge Separator, formic acid can therefore be employed with advantage.—*India-Rubber Journal*, April 20.

RUBBER RESULTS.

It is still much too early to look for actual commercial results from the majority of rubber companies, and most of tho annual reports so far published for the past year deal principally with development work. Out of half a dozen concerns only two have started profit and loss accounts, but these, it is satisfactory to note, show tangible benefits for the shareholders. In an industry in which the producer has to wait six or seven years before his stock-in-trade is capable of making full remunerative return one has to be provided with a considerable fund of patience and also a good deal of faith in the merits of a particular proposition. Generally speaking, of course, tho rubber industry is one of no small promise, and the substantial success of several undertakings is but an earnest of what will undoubtedly be accomplished. It is this hopeful future which renders it an interesting task to watch the career of rising companies and to examine as far as may be their special changes of prosperity. Speculations of this kind must necessarily be somewhat vague and based mainly on fluctuating factors ; but if this be clearly recognised the investor will not be misled by what can only be approximate expectations. The following table covers the proceedings of the half-dozen companies referred to above, and shows what progress has been made during the past year as regards capital expenditure and planting :—

	Capital outlay.		Area cultivated.		Rubber Output			
					1907		1906	
COMPANY.	1907.	1906.	1907.	1906.	Quantity.	Average price per lb.	Quantity.	Average price per lb.
	£	£	acres	acres	lb	s d	lb	s d
Golden Hope	41,900	39,800	845	692	5,600	3 7 2-3	Not shown	
Hidd'n Str'ms	5,500	2,900	400	120	Not producing			
Patlng	32,600	27,000	1,418	1,286	58,100	3 8¼	43,300	5 1 1-16
Rubber Ests of Johore	33,700	14,300	1,935	250	Not producing			
Seafild.	70,100	—	1,528	—	Not producing			
Tenom (Borneo)	24,900	18,400	600	100	Not producing			

Four of tho undertakings, it will be noticed, have not yet reached the producing stage. The Hidden Streams Rubber Syndicate was formed less than two years ago, and has not made as much headway in cultivation as the original programme contemplated. It cleared and planted about 130 acres in 1906 and 330 acres in 1907, leaving about 146 acres to be felled and planted this year. Thus far the cost has been equal to about £12 an acre, including the purchase price, which seems a reasonable enough average. The Directors do not venture on any estimate as to when output will begin, but as the entire estate has to be planted, some little time must naturally elapse before the trees are sufficiently mature to tap. The labour supply is good, and one of

the Directors who visited the property in January states that the fields have a promising appearance. The Rubber Estates of Johore has just begun its third year. In this case progress in cultivation has been more rapid than was looked for, and by the end of December it is hoped to have 3,000 acres under cultivation. The Manager, however, is wisely anxious not to bite off more than he can chew, and as the cost of bringing the planted area into bearing is proving to be rather heavier than was expected this also will probably restrict too vigorous an expansion. The report of the Seafield Rubber Company for 1907 is the first issued, but as the estates were partly developed when acquired, planting is in a forward condition and a fair proportion of the trees are not far off the yielding stage. It is expected that by the end of the year some 2,080 acres will be cultivated. Recent expert advices from the property point to a successful future. The Tenom (Borneo) Rubber Company has made swifter strides during its second than it did during its first year, and it has now over 8 0 acres cleared and 600 planted. Further land is to be acquired, but the programme of the Directors is not ambitious, and all they aim at at present is to cultivate some 1,500 acres. The trees are expected to come into more or less full bearing by 1912, and until that time the British North Borneo Company pays 4 per cent. per annum on the Ordinary capital. The remaining two concerns—the Golden Hope Rubber Estate and the Pataling Rubber Estates Syndicate—are in the yielding state, with satisfactory results to the shareholders. The financial showing for the past two years is set forth in the table below:—

Company.	Rubber sales.		Net profit.		Dividend.		Carry forward.	
	1907	1906	1907	1906		1906	1907	1906.
	£	£	£	£	o/o	o/o	£	£
Golden Hope	3,400	2,500	3,290	3,200	6	5	2,000	1,200
Pataling ..	11,800	13,000	7,200	8,600	35	40	900	7 0

The Golden Hope has now practically finished the planting of its property, and though it is proposed to acquire additional land, this is already cultivated. More rubber trees come into bearing each year, but it is not till 1909 that a really large yield is to be looked for. Thus the bulk of the revenue is still derived from coffee, and it is the drop in income from this source which explains the stationary net profit, notwithstanding the increased sales of rubber. Nothing was brought into 1906 from 1905, whereas £1,200 was brought into 1907 from 1906, and it is this which permits the dividend to be raised from 5 to 6 per cent. and a bigger balance to be carried forward. The capital of the Company has just been increased from £40,000 to £50,000, and new shares to the extent of £4,000 have been offered to the existing proprietors. While this is the second dividend distributed by the Golden Hope, the payment made by the Pataling is the third, and brings up the total to 95 per cent., so that the shareholders have very soon got their money back again. The Company was formed as recently as 1903, and by the end of this year the cultivation of the property so far as is at present contemplated will have been carried out. There was a considerable increase in the yield of rubber last year, but a drop in the price reduced profits, and accounts for the smaller surplus available for distribution and for the reduction in the dividend. Experience in working the estate has enabled certain economies to be effected, and the result of this will probably be more apparent during the current year. In this case also the Directors require further capital, and the shareholders have recently had the opportunity of taking up £2,500 new shares at a premium of 300 per cent. In addition to rubber undertakings pure and simple a good many tea companies which grow rubber have also issued their reports during the last few weeks. These mostly belong to the Ceylon group, and a steady extension of rubber interests is observable in the original programme of these plantation enterprises. At present rubber revenue is relatively small, but the time must come when it will closely press that now derived from tea, coffee and other products.—*Financial Times*, April 14.

RUBBER GROWING IN QUEENSLAND.

OPTIMISTIC ESTIMATES: WITH WHITE LABOUR.

The cultivation of Para rubber is beginning to assume some promise of advancement in the North of Queensland. A number of settlers are obtaining plants from the Kamerunga State Nursery, near Cairns, and selecting land for the purpose. Places abound all along to coast, from Bowen northwards, where rubber plantations would grow well and be a source of much profit to their owners. A shipment of plants has just been received from Singapore, and has been distributed by the Government to intending cultivators. To utilise the northern lands by such industries is one of the problems which the State has to solve. No greater barrier probably to the inroads of the coloured races from the East could be found than for the white population to engage in these operations of the land, and to show that they can be worked with abundant profit. There is little question that substantial and permanent profits can be made. A selected plot, for instance, of 300 acres, planted about 100 trees to the acre, brings in the course of a few years a good reliable revenue. If, at the end of the fifth or sixth year, each tree only produced 1 lb. of rubber, and this sold at the common price of 5s. per lb. the income from the plantation would reach £7,500. If one-third of that sum had been spent in expenses, the returns would be large. For years too that revenue might be received without only special additional cost. The annual consumption in the United States, Germany and England is 49,583 tons, and the average price received by those countries that export it is £256 per ton. Queensland hopes to capture some of this floating cash in the world's market. With its tropical lands, so adapted for rubber-growing, the cultivation of it being so simple and comparatively inexpensive; and the enormous demand for the product, it seems incredible that so little hitherto has been done in the way of rubber-growing; but the start has now been made, and it may be hoped that before many years the production of rubber will be one of the important industries of the State. Samples of Queensland-grown rubber may be inspected at the Queensland City office, 73, Basinghall Street, London.—*Australian paper*, April 22nd.

RUBBER CULTIVATION.

Castilloa Rubber in Cuba.—Castilloa rubber trees appear to do well in Cuba, although their value does not seem to be recognised by many planters on whose estates the young trees grow wild. The chief of the Botanical Department at the Agricultural Experiment Station has recommended that Castilloa trees be grown as shade for tobacco plants in place of many worthless treos that are now used for this purpose.—(*Cuba Review*).—*Agricultural News*, April 18.

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Rubber in Malaya.—The following appears in the Second Annual Report of the Kuala Selangor District P.A. for the year ending February 29th, 1908 Cultivation.—The following is a table showing the cultivated area and the acreage of land held by Europeans in this district. This includes estates which are not on the membership of the Association and is, therefore, a thoroughly comprehensive statement:—

Para Rubber.

Under 1 year.	Under 2 years.	Under 3 years.	Under 4 years.	Under 5 years.	In bearing	Total.
8,357	3,476	778	—	60	35	12,706

Rambong.	Coffee.	Coconuts.	Rubber & Coffee.	Other Products.	Unculti-vated.	Total Area.
127	—	382	165	—	23,286	36,666

* * * *

Rubber in South Coorg.—Pollibetta, April 24. The rain has set all fears of fires both in the Government reserve forests and in the rubber clearings at rest. The Cearas have begun to throw out shoots and will all soon have fine heads of leaves. Plants put out during the last S W Monsoon in low-lying swampy land, which has been subsequently well drained, have made surprising growth, having attained heights of 15ft. and over. On raised land the growth has not been so rapid, but is certainly quite satisfactory. It is a pity that the superior species of *Manihot* mentioned by your Special Planting Correspondent in the *Madras Mail* of the 20th instant as having been discovered in Bahia, in 1901, were not known to planters in India before, especially as the tapping is said to present no difficulties as it does in the case of Ceara rubber (*Manihot glaziovii*) but it is not too late to plant up existing Ceara bearings with the better species of *Manihot*. *Manihot dichotoma* would appear to be best suited to the soil of these parts, as it is said to thrive on heavy clay. As the Ceara is planted 15 ft. by 15 ft. the above species, as it is a tree of smaller growth, could be planted 7½ ft. apart between the rows of Ceara, and 15ft. apart in the rows of the latter, that is one between every two existing Ceara trees. These may eventually be got rid of by severe tapping or be put down and dealt with by a rubber-extracting machine, and their places be supplied up with the superior species. The latter would be then at 7½ ft. by 7½ ft. and over, which would be amply sufficient if the yield was anything near what it is stated to be in Bahia.

Rubber in British Guiana.—On the 10th inst. Messrs. Smith Bros. & Co. Georgetown, received by the s s "Massaruni" from the North West District 5,534 lb of balata and 539 lb. of rubber from the B. G. Rubber Corporation, Ltd., the largest quantity yet received for export.

Permission has been granted to the Barama Syndicate, Ltd., under the Crown Lands Ordinance, to collect rubber plants on the right bank of the Barima River on the tracts held by them under licences; and a similar permission has been obtained by the B. G. Rubber Corporation, Ltd., the area including the right bank of the Barima, the left banks of the Waini, and the right and left banks of the Aruka River.—*Demerara Chronicle*, April 18.

* * * *

Rubber in Colombia.—Extensive plantations of Castilloa rubber are reported by the U. S. Consul at Cartagena to be in course of formation in Colombia. At least 1,600,000 trees have been planted in different river valleys, but these are at present too young to have made much return. At present the Colombian output of rubber is chiefly from wild trees, and collected chiefly by Indians.

Rubber planters do not seem too sanguine as to prospective yields. One grower reported an annual return of 1,121 lb. of dried rubber from 14,155 trees, of eight years old. The trees were carefully tapped, and this yield would work out at no more than 4 oz. of rubber per tree per annum. Other planters, basing their expectations on wild rubber returns, assert that at least 1 lb. of rubber per tree per year should be obtained.

The total shipments of rubber from Cartagena in 1906 were 351,076 lb., and 300,696 lb. in the first nine months of 1907.—*W. I, Agricultural News*, April 4.

PERUVIAN METHODS OF RUBBER CULTIVATION AND TAPPING.

An American Consular report from Iquitos, by Mr Chas. C Eberhardt, describes the methods regulating the rubber industry in Trans-Andean Peru. The laws of Peru governing the acquisition and working of rubber tracts are still incomplete and undergoing constant amendment, but at present the following steps are considered to be necessary:—

SELECTION OF A TRACT OF LAND

is made and the location, description, etc., of the property advertised in the official organ for 30 days, that any claims against said property may be registered. At the expiration of this time, no countercharges having been made, the prefect of the department is petitioned, and he appoints a surveyor to lay out the land, furnish a plan of the entire tract, etc. This plan, together with the original description of the land, petition to the prefect, and all papers bearing upon the subject, are forwarded to Lima for final action. If the procedure in the earlier stages has been regular in every particular, the request is rarely refused, though the difficulty of communication between Lima and the department of Loreto at present requires that from six months to a

year usually pass before final title is received, and this is only in the form of a lease for 10 years, with the privilege of renewing at the expiration of that time, as the lands are not sold outright. No fixed cost can be given for such procedure, because it differs according to the difficulty of access to the tract for the surveyor, the bargain made by the petitioner with different parties employed, etc.

The title for 10 years having been secured, the petitioner may use the land as if it were his own, and his first movement is usually to place men at work locating rubber trees. One man will open up what is called an "estrada" consisting usually of as many rubber trees as can be visited and worked by a rubber gatherer in one day, the number of trees differing as the district may be thickly or thinly studded with such trees, the rapidity with which the rubber gatherer may work, etc. For instance, near Iquitios, many "estradas" contain but 75 to 80 trees, in the Javary river district the average is 150, while in the Acre district it is said that some estradas contain as many as 400 trees.

For locating an "estrada" and clearing a path from tree to tree the workmen receive from £5 to £7 10s. When this preparation has been completed all is in readiness for the work of rubber gathering which goes on during the dry season from July to January, the trees being

TAPPED IN A FRESH SPOT EVERY OTHER DAY

during that time. Work cannot be carried on during the entire year for several reasons: (1) By such constant tapping the tree would be worked to death in a short time; (2) during the rainy season a great portion of the land is absolutely impassable, because of inundation; (3) the rain water flowing into the cups and becoming mixed with the liquid renders it unfit for market.

The rubber worker in the more thickly settled districts is usually a poor labourer who buys his supplies or provisions, consisting chiefly of rice and beans, from his "padrone," the owner or renter of the "estrada," whom he must pay in rubber, at prices prevailing at the time of delivery. Charges for provisions are usually extremely high, and at the end of the season the labourer, though he may have delivered a large amount of rubber, is rarely out of debt to his "padrone."

In a tract recently visited by the Consul there were 24 "estradas" worked every alternate day during the season by 12 rubber gatherers. Mr Eberhardt accompanied one of the men in his work and performed all the duties of the position, tapping the trees, placing the tichuelas, gathering the latex, and finally smoking the same over a half-smothered fire.

A start was made at 5 a.m., and the work of tapping the trees and placing the cups (each with a capacity of half-a-pint) was performed.

The smallest trees, about six inches in diameter (6 in. + 3 1·7th = nearly 19 inches in girth), carried two of these cups, and the largest visited in the day, about 2ft. in diameter, carried nine. The average was four or five cups on trees 15 to 18 inches in diameter. During much of the time spent going round the "estrada" the Consul and his companion waded through the standing water of the

SWAMPS

almost to their waists, and it was ten o'clock before they had visited all the 150 trees.

When an entire round of the "estrada" had been made it was time to commence gathering the latex. The trees were again visited and the cups emptied into a can of about 2½ gallons capacity, which was carried round. Many of the cups contained less than a tablespoonful of liquid; the day's work produced about two gallons.

On returning to the hut in the afternoon this liquid was smoked in the usual way over a half-smothered fire till it formed into a hard white substance which later turned black of approximately two kilos, weight (4½ lb.). This is the rubber known locally as "jebe fino." A

NEW SERIES OF WOUNDS IS COMMENCED EVERY MONTH

at a point as high as the workman can conveniently reach, each subsequent wound being made a little below and in the same vein, till the bottom of the tree is reached at the end of the month. When a tree has been overworked and the milk does not flow freely, a scaffolding is constructed about the tree, which the worker mounts and inflicts the wounds farther up along the trunk. This practice, however, is very injurious to the tree, if not absolutely fatal in the end, and was forbidden on the tracts visited by the Consul.

The foregoing are the methods ordinarily employed in working the "jebe fino," best grade of rubber, and "jobe debil," second grade.

To collect "caucho," Mr Eberhardt says the tree itself is cut down, so that regions where it could once be collected in abundance are now entirely denuded of such trees except for the young ones growing up. He is of the opinion that natural recuperation cannot keep pace with the present rate of destruction. With regard to trees producing "jebe fino" and "jebe debil," he says that in spite of the assertions freely made by rubber gatherers that there is no cause for alarm at the increasing number of trees dying in proportion to the number of new ones springing up, and the further admitted fact that many of the trees which have been worked for twenty and thirty years are still productive, there is no denying the fact that, in Peru at least, the number of rubber-producing trees is steadily growing less. Systematic planting and cultivation would be of inestimable benefit to the country and the individual.—*India Rubber Journal*, May 4.

FIVE SEEDED HEVEA FRUIT.

Mr. Lowther Kemp sends two samples of five-seeded fruit of *Hevea brazi nsis* from the Sioni Rubber estate forwarded by Mr. E A B Brown, the manager. Normally as is well-known the *Euphorbiaceae* have three-seeded capsules, whence at one time they were known as *Tricocci*, but occasionally we get abnormalities of this kind. We have met with fruit of Hevea with two, four and five seeds. Some trees are very irregular in this matter, and one tree in the Singapore Botanic Gardens produced quite a large proportion of four and five seeded capsules on several occasions.—H. N. R.—*Straits Agricultural Bulletin* for May.

RUBBER IN SOUTH COORG.

RULES FOR GRANTING ABANDONED COFFEE LANDS: FROM DECEMBER NEXT.

Pollibetta, May 25.—The Cearas are making good growth after the early rains. Holing for planting out Para with the setting in of the monsoon has been commenced. Some early planting out of Ceara has been attended with success.

The following is the revised draft of Rules under which abandoned coffee lands will be granted for rubber cultivation up to the 1st December, 1908. The draft will be taken into consideration after the 25th May, 1908 :—

(I) Land shall be bought at an

UPSET PRICE OF R2-3-0 AN ACRE.

(II) Land shall be free of assessment for eight years. Thereafter the rate of assessment shall be R2 an acre, and this rate shall be subject to revision at the end of 30 years.

1,000-ACRE OPTIONS.

(III) A grantee may be given the option of taking up more land adjoining his original grant up to a total limit of 1,000 acres, provided that the total area taken up is in a compact block. This option need not be exercised for the whole area at once, but not less than 100 acres shall be applied for at a time, and the option shall lapse over any portion of the area not taken up within the number of years represented by the number of hundred acres in the whole area claimed.

(IV) If the land applied for adjoins a perennial stream, river or public road, and it is not considered necessary to reserve the whole land, a

BELT SHALL BE RESERVED ON EITHER SIDE

of the stream, river or road of such a width not exceeding 50 yards as may be considered necessary in each case.

(V) To allow proper facilities for clearing the land without depriving the Government of the value of the timber in it, the applicant shall, after a land is made over to him for rubber cultivation, give notice to the Forest Department in the month of September of each year of the extent and situation of the area that he intends to clear and plant in the succeeding year. The Forest Department will arrange to cut and remove within six months of the receipt of the notice all timber on the area likely to be cleared by him. Each succeeding year a similar notice shall be given of the area intended to be operated on in the year following to enable the

FOREST DEPARTMENT TO REMOVE TIMBER ON SUCH AREA.

(VI) The Forest Department will not enforce its claims to any timber (other than sandal) remaining uncut after the expiry of the period of six months from the receipt of notice in each year, on the area in regard to which notice has been given by the applicant. The applicant will be free to cut such trees (other than sandal) and to appropriate or sell the timber.

(VII) In the case of the first grant, if the grantee wishes to begin planting at once and considers that it will hamper his operations to wait for six months until the Forest Department have removed the reserved trees, it shall be open to him to request that Department to

MARK WITHIN TWO MONTHS THE TREES

they wish reserved on an area not exceeding 100 acres, and to cut them himself, leaving the Forest Department to remove them subsequently, provided that this period of two months is between the 1st December and the 1st May.

(VIII) After the upset price of R2-3-0 an acre shall have been recovered a title deed in the form annexed to these rules will be issued. This title deed will also cover those parts of the land which may be taken up subsequently in exercise of the option referred to in rule (iii) provided the conditions specified in the schedule to the title deed so far as the same respectively relate to or affect such subsequent grants are satisfied. Until receipt of the title deed no grantee will have the power of alienating any portion of the land granted. Alienations made in contravention of these rules will render the grant liable to be withdrawn.

These Rules appear to conform to the Rules of the Mysore Government for the grant of lands for rubber cultivation in that State in so far as they insist on a belt of forest being left uncleared on both sides of streams and rivers. In the case of abandoned coffee lands these plots will probably be overrun with Lantana, of which the Government are making efforts to rid the Province.

AGAVE.

Lands other than abandoned coffee lands will be granted for agave cultivation under Rules similar to those governing the grant of abandoned coffee lands for the cultivation of rubber, except that the only condition that will be insisted on in the selection of land is that it should not be one which, for the protection of springs or for the preservation of the hill sides or other well marked natural features, or on account of its containing valuable timber or being evergreen forest, it is considered necessary to reserve to Government. To enable this condition to be enforced, all applications for land should be referred to the Deputy Conservator of Forests for investigation and opinion before grants are made. In these cases also belts will be reserved on the sides of streams, rivers and public roads.—*M. Mail*, May 29.

SISAL HEMP

Is receiving increasing attention among planters in India. The "Muir" Company reports alone, are sufficient evidence of this; three of the four Companies are putting in the following acreages in the product this year :—

Kanan Devan Hills Produce Co. ... 50 acres.
Amalgamated Tea Estates Co. ... 100 ,,
Consolidated Tea and Lands Co. ... 250 ,,

In this connection "One Interested" writes to the *Englishman* on May 17th, asking for an explanation of the extraordinary and unprecedented fall in home prices, said to have over taken the market for Sisal hemp. This fibre for some time past has fetched on the London market about £28 a ton and over. From past experience £28 may fairly be regarded as somewhere near the average price of the commodity. Without, it would seem, any gradual shrinkage in value, the market in London, for some unaccountable reason, is stated to have suddenly dropped from £28 to £8 11-6 a ton—while a Sylhet concern, it is said, failed in obtaining an advance beyond a fraction over £7 a ton. Elsewhere than in Yucatan and Florida, the cultivation of Sisal is a comparatively new industry. Its expansion, being largely if not entirely governed by climatic influences combined with proximity to the sea, is necessarily confined to well-ascertained areas; and as it takes from four to five years before the plant comes into full bearing, sudden and violent fluctuations, such for example as the London market is now experiencing, seem almost beyond the bounds of possibility.

MOLASSES

A by-product in sugar-making which planters in Java looked upon as being almost worthless, and which they often pitched into the nearest river to get rid of it, has suddenly been found to possess market value. It is now bought up eagerly in Java and exported to Calcutta, where the article meets with a ready sale at a large profit.—*Straits Times*, May 15.

COTTON-GROWING IN THE DUTCH COLONIES.

Amsterdam, May 13.—With regard to the cultivation of cotton in Dutch Colonies, favourable reports are to hand from the West Indies. Recently, too, this cultivation was also introduced in Java. The Government is doing all it possibly can do to promote the growing of cotton in the district of Samarang, and thus to benefit the native population. In the district of Kediri the first steps in this direction have been taken, and in Djambi the cultivation is in full progress.—*L. & C. Express.*

STRAITS RUBBER NOTES.

Including the trees at the old experimental nursery on the hill there are 43 Para trees in the garden; of these seventeen are over three feet in girth, nineteen over and seven under two feet. I had expected there were more. In the absence of Mohamed Haniff it was necessary to train a man to tap and 21 trees were tapped and 35 lb. of rubber obtained. Now that a man can tap without injury, this work will proceed better altbough the drying process is difficult and long, through smoking being necessary owing to the damp situation of the garden. The old Para tree supplied two pounds of dry rubber making the grand total from this tree 37 lb. 13½ oz. All the rubber is not yet dry enough for sale.—*Mr Ridley's Report* on 1907.

NEW RUBBER-CONTAINING PLANTS.

Rubber (including gutta-percha) is known to occur in about a dozen families of plants, of which the more important are the *Euphorbiaceae*, *Urticaceae* (*Moraceae*), *Apocynaceae*, *Asclepiadaceae* and *Sapotaceae*, whilst the *Loranthaceae* and *Compositae* will probably also become of considerable importance in the near future (see *Tropenpflanzer*, 1905, p. 633; and *Kew Bull.*, 1906, p. 218; 1907, p. 285). In the remaining five families the occurrence of rubber is at present a matter of theoretical interest only, as it has not yet been shown that its extraction would be remunerative; they are the *Trochodendraceae* (*Eucommia*), *Tiliaceae* (*Plagiopteron*), *Celastraceae*, *Hippocrateaceae* and *Lobeliaceae* (*Siphocampylus*), whilst a sixth, *Convolvulaceae*, is given by Czapek as also containing rubber (*Biochemie*, vol. ii. p. 709).

The presence of rubber in three African species of *Gymnosporia* (*Celastraceae*) is recorded in the *Notizblatt des Konigal. botanischen Gartens und Museums zu Berlin*, No. 42 (Bd. V.), of March 11th, 1908, by Dr. Th. Loesener, who prefaces his account by a summary of our knowledge of the occurrence of rubber in the family.

Radlkefer, who was the first to detect rubber in the *Celastraceae*, found it in the Mexican genus *Wimmeria* (*Bot. Gaz.* vol. xviii., 1893, p. 199). The leaf anatomy of the *Celastraceae* was afterwards investigated with special reference to the occurrence of rubber by Metz, who recorded its presence in special laticiferous cells of the leaves in eight species of *Wimmeria* and in the South African *Mystroxylon eucleaeforme*, whilst in no fewer than thirteen genera, rubber was present in the form of small masses in the cells of the parenchyma (*Beih. Bot. Centralbl.* vol. xv., p 309), in some of these genera, however, the rubber may have been present in laticiferous cells in the stem and root, although not occurring in special cells in the leaves; this was found to be the case in *Euonymus*, for example, by Col (*Comptes Rendus*, vol. cxxxii., 1901, p. 1,354).

It is obvious that the extraction of rubber could not be profitably undertaken, where it is present merely in the cells of the parenchyma. In the three species of *Gymnosporia* investigated by Loesener, however, the rubber is present in special laticiferous cells, which occur in the bark, the leaves and the inflorescence; but it is still unknown whether the rubber is of sufficiently good quality and present in sufficient amount to make its extraction profitable. Further information is also required as to the geographical distribution of the three species and their mode of occurrence, before an opinion can be formed as to the value of Loesener's discovery. The presence of the rubber may be detected by carefully breaking in two a leaf or a piece of bark, when the portions remain connected by fine elastic threads which stretch from one broken surface to the other and which can be drawn out for a fair distance before breaking, when they rebound and curl up.

The three species, which are closely allied to one another, are all spineless and are natives of inter-tropical East Africa. Two of them, *G. amaniensis*, Loes., and *G. Bukobina*, Loes., are new species, of which the descriptions will appear in the forthcoming part of *Engler's Botanische Jahrbucher*, vol. XL., now in the press: and the third, which was described by Loesener in 1893 as a new species, *G. lepidota*, Loes. (*Engl. Bot. Jahrb.* vol. xvii., p. 549), is now regarded by him as a variety of the common and polymorphic *G. acuminata*, Szysz., a native of S. Africa.

G. amaniensis was collected by Warnecke in the neighbourhood of Amani, East Usambara, at an altitude of about 2,700 feet, and is described as a relatively slender tree, attaining a height of 100 feet. *G. bukobina*, on the other hand, appears to be a climber; it was discovered in 1903 by P. Conrads not far from Bukoba, to the West of Victoria Nyanza, at about 4,000 feet. *G. lepidota* seems to be more widely distributed than the other two even if we regard it as distinct from *G. acuminata*, having been recorded from Mts. Ruwenzori, Kilimanjaro and Mawensi, and from the Uluguru Mountains in Ukami, at altitudes varying from 7,000 to 11,000 feet above sea level. According to Loesener it is a tree about 33 feet high, but Dawe, who collected it on Ruwenzori at about 11,000 feet describes it as a shrub 10 feet high, and no doubt the height varies according to the altitude and exposure. In the Uluguru Mountains the tree is called "Mbamala" by the natives, according to Goetze.

T. A. S.

—*Kew Bulletin*, No. 4 of 1908.

PINE-APPLE CANNING

Is a great business at Singapore—and also in the far West of Hawaii islands. We read that there is a boom on in the latter just now:—"The canning men pay one cent (of a dollar) a lb. for pines. Plant 10,000 to the acre—too close, I think—average pine 4 lb., equals 400 dollars (£80) per acre, less cultivation and cartage. Not so bad!"—But there is the great American market for fruit close by. Still, something should be done in the lowcountry of Ceylon in "canning" for the European market, seeing what is done in the Straits.

COFFEE-GROWING BONUS FOR THE NEW HEBRIDES.

The Collector of Customs (Mr. Clayton T Mason) has received the following notification from the Comptroller-General, Melbourne:—"A Government bonus is paid on coffee grown by British labour in the New Hebrides and imported into the Commonwealth. The payment of this bonus is in the hands of the Department of External Affairs. In connection with this bonus importers of the coffee are required to produce a certificate, from this department at the port of entry, to the effect that a given quantity of coffee was landed from a certain vessel which arrived from the New Hebrides."—*Westralian paper*, May 19.

SINGAPORE ECONOMIC GARDENS.

Mr Ridley's Report under this head for last year, includes the following:—

The garden was kept up in a very good condition as well as could be expected, considering for the greater part of the year, the European staff was reduced to the Assistant only. The export of plants and seeds of economic interest was greater than usual, not only in Para Rubber, but in other products, a matter of satisfaction as it shows that the agriculture of the tropical English colonies is not being confined to Rubber only. There was a demand for seeds of the Oil Palm (*Elaeis guineensis*) due to an article in the "Agricultural Bulletin" of this year pointing out the value of this plant in cultivation. Fibre plants were also in great request and though the cultivation of these has been slowly making its way in the Peninsula, still there are signs of its really playing an important part in the local cultivation in the near future.

CATCH CROPS FOR RUBBER

as represented by Groundnut, Citronella and Lemon-grass, were in demand. Camphor seedlings were taken for trial in several of the estates in the Federated Malay States. Fruit trees were required also largely for the Federated Malay States, where the supply of fruit is by no means what could be desired. The Para Rubber seed crop was the biggest on record, viz., 410,600 of which 405,600 seeds and 13,100 seedlings were disposed of. The Gutta Percha fruited well and 1,380 seeds were sent to Mauritius, but travelled very badly. Of *Willoughbeia firma*, 18 seedlings were sold. Besides these 100,000 Rubber seeds were purchased, packed and sent to British New Guinea. Fibre plants were sold as follows:—Ramie 3,170, Sanseviera 10,000, Manila Hemp 130, Mauritius Hemp 150 and of fruit trees various kinds 1,700 plants and 12,000 seeds. A big sending of Coconuts to Lagos was 3,000 nuts in crates, and requiring 30 carts to convey them to the docks. Of Tapioca 300 plants, Coffee 125, Citronella 160, Lemon-grass 250, Camphor 750, Cocoa 160, Nutmeg 172, Oil Palm 3,030 seeds, Ground-nuts 50 lb. seeds. The greater part of these seeds and plants were supplied to the Federated Malay States and Johore, chiefly to Selangor and Perak. Of other Colonies, Lagos, British New Guinea, Southern Nigeria, and the Caroline Islands were the chief recipients. The total export of plants and seeds this year was:—

Economic Plants	...	18,085
Ornamental Plants	...	6,744=24,829
Economic Plant Seeds	...	525,310

Ornamental Plant Seeds (sold and exchanged) 8 packets. When the Gutta Percha trees were fruiting, the fruit bats attacked the fruit in such numbers that it was with difficulty that any of the crop was saved at all. The lower part of the best tree was covered with cloth and nets, lights were put in the tree and a Tamil Bat-catcher employed.

RUBBER-PLANTING IN S. COORG.

South Coorg, May 28.—With regard to rubber, holing for planting out Para has been commenced, and Ceara seedlings are being raised to supply vacancies in existing Ceara clearings, and for planting extensions. Both the above will be planted out as soon after the setting in of the S.-W. monsoon as circumstances will permit. Unfortunately, at present labour is not at all equal to requirements. One reason for this is that coolies were paid off late in the season, and many who went back to their villages have not returned. Coast contractors have to be largely employed to make up for the deficiency in estate hands, but even they are slow in coming in. The Ceara clearings have come on most encouragingly. Wild pigs have proved destructive in uprooting plants, but the proportion so destroyed is not large, and beyond this there are not many vacancies to supply. The Para plants from seed put down last September and October have grown very well in the nurseries, having attained a height of 2 feet in many cases. If this growth is maintained in the field, it will be most satisfactory.—*Madras Times*, June 1.

YOUNG BEES AND THEIR LARVAE

(Of a certain wild species) are regarded as a delicacy in food in some parts of Japan. The bees live in earth holes and are caught by being smoked into stupefaction by burning gunpowder at the entrance. The dish is prepared with sugar and "Shozu" sauce, and is sold in tin cans. One kilo (2 1-5 lb.) costs 2½ yen or 10s,

COTTON GROWING IN CENTRAL ASIA.

Relief Work on 5,800,000 Acres for Russian Unemployed.

Our St. Petersburg correspondent writes:—By reason of its anxiety to improve the economic situation, and to give the unemployed something to do, the Russian Ministry of Finance is said to be in a complaisant humour at the present moment with regard to the granting of concessions; and it is now considering, among other things, the proposition of a group of capitalists, with a well-known financier at their head, who have applied to the Government for a grant of about 2,000,000 dessiatin (one dessiatin equals 2·70 acres) in the Hungry Steppe, Central Asia, in order that they may try cotton cultivation there on a large scale. The concessionaires demand nothing more from the Government than the land, which they desire should be granted on condition that they irrigate it. If they succeed in growing cotton there—where cotton was undoubtedly grown to a great extent in ancient times, for traces of the old irrigation canals still remain—it is calculated that Russia can supply herself with all the cotton she wants, and need not, therefore, spend 75 million roubles abroad every year in buying it. It is calculated that the irrigation works will cost 50 roubles per dessiatin, that is 50 million roubles for one million dessiatin. While admitting the necessity for carrying out cotton cultivating experiments in Central Asia, the *Russ* objects to such huge areas of land as two million dessiatin being handed over to any company. The experiment would, it thinks, end in corruption and swindling,—*Economist*, May 9.

PUMELO.

May 26th.

Dear Sir,—One hesitates to enter the lists against so well-recognised an authority as Mr Donald Ferguson, but in a matter about which there is still some doubt one might be permitted to make a suggestion.

Given two names, French and English—Pamplemousse and Pumelo—I do not quite see why there need be any connection between the two, or why we should try to evolve the latter from the former; though it may be true that we have some extraordinary English corruptions of foreign names, witness Jerusalem artichoke, where Jerusalem is merely a corruption of the Italian Girasole. Whatever may be the derivation of pamplemousse, may we not assign to the word pumelo its simplest and, to my mind, most reasonable derivation, viz., from pomum (fruit) and me'o (melon)= pomum-melo, melon fruit, an appropriate enough name for a large succulent fruit not unlike a melon in appearance (cf. tree melon, another name for the papaw, and pomegranate=seedy fruit.)—Yours truly,

C. D.

P.S.—I have, since writing the above, discovered that I have good authority for the above derivation,—C.D.

INDIAN TEA ASSOCIATION.

Royal Exchange Building, Calcutta, 19th May.

[We extract from the proceedings of a meeting of the I T A general committee held on the above date:—]

Correspondence with the Indian Tea Association, (London).—A letter of 1st May from the Secretary, Indian Tea Association, London, which had been circulated, was now brought up for final consideration and disposal.

Exports of Tea from Northern India to Ceylon.

Sir James Buckingham referred to a matter that has been before the General Committee in connection with the exports of tea from Northern India to Ceylon; these have recently increased very considerably and in 1907 amounted to over six million lb., and the Committee have been endeavouring to ascertain how these are treated on re-exportation from Ceylon—whether as Indian or Ceylon exports. With this in view they asked the Collector of Customs, Colombo, whether he could supply them with monthly statements showing the quantities of Indian tea transhipped at that port, as it is thought that a very small proportion of these teas are consumed in Ceylon. The Committee were informed by the Collector that a monthly

RETURN WOULD NOT GIVE THE WEIGHT OF THE TEAS

transhipped, as this weight was not recorded in Colombo, and that merely a note of the number of packages was kept; but they asked him in reply to favour them with these monthly statements as they thought that even the number of packages alone would give an indication of the quantity transhipped; and in his letter of 1st May Sir James Buckingham suggested that the same estimated average might be taken for these teas as that taken by the London Tea Brokers' Association for London—106 lb. for chests and 60 lb. for half-chests. The Collector of Customs has, however, now replied that although a statement might be furnished as regards teas deposited for transhipment in Customs premises particulars could not be given for teas transhipped direct from vessel to vessel, as some firms manifest all cargo as 'merchandise' or 'packages' and tranship them as such in their applications.

Although the Committee anticipated that, as a result of the new direct services that have been arranged between Calcutta and Vladivostock the quantities of tea requiring to be transhipped at Colombo will probably not be very great in the future, it was agreed that it would be useful to have a monthly statement of these if possible, and after discussion they decided to

COMMUNICATE WITH THE CEYLON CHAMBER OF COMMERCE

and ask them whether they could give any assistance in the matter. It was also arranged to apply to the Collector of Customs, Calcutta, to see if he could supply the Association with the information required.

Assam Labour.

Mention was made in the proceedings of 10th March last of the appointment of a Sub-Committee to consider the question of a Central Recruiting Agency; and the report of the Sub-Committee was now submitted. This recommended

that in the first place steps should be taken to ascertain whether the scheme for a Central Recruiting Agency, to embrace both *sardari* and *arkutti* recruiting, would be likely to be accepted by Proprietors, and a Memo. was given indicating broadly the lines upon which such an Agency might work. The terms of the Memo., which was to be submitted to members of the Association, were agreed on; it was arranged that the Secretary of the London Association should be asked to ascertain the views of home Proprietors and to cable as soon as possible, whether the scheme would be likely to receive such support as would warrant further steps being taken in connection with it.

THE RUBBER INDUSTRY IN JAMAICA.

Systematic rubber planting in Jamaica as an industry has only of late years begun on estates, but up till now there has been no systematic tapping of trees and keeping of statistics of yield, on which to base commercial calculations of the profitableness or otherwise of the business. From the standpoint of a profitable industry there is a great hope in rubber, especially as, although the trees require good soil, they can be grown to advantage in many places, dry or wet, upland or lowland, or in patches. This business would not only be of value in creating a new profitable industry, but would incidentally assist in reforesting the more select lands. Intelligent advice has been at our disposal, as to varieties to plant. Mr Robert Thompson says Manicoba rubber for certain dry parts; Virgen rubber for certain select parts of the mountains; Castilloa and Para for moist lowlands, up to 1,800 feet, the latter may also grow up to 2,000 feet, but would require test.—*Journal of the Jamaica Agricultural Society*, for April.

RICE EXHIBITIONS IN SIAM.

The Royal Agricultural Department of Siam has made a new departure by instituting provincial rice exhibitions, at which both native and foreign varieties are exhibited and distributed for

EXPERIMENTAL CULTIVATION.

Great interest has been taken in the first exhibitions, to which 450 cultivators sent specimens of their produce, and it was announced by the Minister of the Interior that in future similar exhibitions would be held in all the principal provinces, while a large central one would be organised in the capital at which every facility would be given to manufacturers of agricultural and other machinery which may be in any way connected with or useful to rice-growing.—*Rangoon Gazette*, May 18.

INDIAN DUST AND HANKOW BRICK TEA.

The large and increasing consignments of Indian tea dust sent to Hankow are, we now know, for the manufacture of "bricks," partly for consumption in the districts to the north of that city, though the greater portion finds its way to Rhima, whence caravans convey it across the dyal (or meadow) in Eastern Tibet to Lhassa and other towns. Now Rhima is no great distance on the old route to China from Assam, it strikes therefore that we could lay down 'bricks' made on the Upper Assam gardens cheaper than they can be sent by the long round-about Hankow route The road to Rhima from all accounts can at no great cost be fitted for either rail, tram or motor carriage, so say travellers, then there should be no great difficulty in verifying this statement; should it really turn out feasible we should have a profitable enough market almost at our door. If the scheme succeeds, it would be better perhaps to have a central brick-making factory which could take the dust off the planters' hands, as there is quite enough work in the tea houses of existing factories without bothering individual planters with anything additional. An outlet for Lower Assam bricks might be found, *via* Dewangiri, as the people to the North of that place not long since expressed a desire for trading with us.—*Indian Planters' Gazette*, May 23.

TEA IN RUSSIA.

AMERICAN CONSULAR REPORT.

Consul William W Masterson, of Batum, transmitting the following information, reports that the Russians are believed to be the greatest consumers of tea of any people in Europe:—

About one-half the tea imported into this district is received by sea at the ports of Batum and Novorossisk, and is entered through the customhouses of Tiflis, Baku, Askhabad, Bokhara, Samarkand, Kokand, etc., but a great portion of the tea reported from the customhouses at Askhabad, Bokhara and Samarkand is imported direct from China by caravan and by the Siberian Railroad, and it is impossible to tell just how much comes by sea and how much overland.

Of the 37,759 tons of tea imported into the district during the past seven years, over 32,000 tons were green tea, the most of which is reported in the three Central Asian custom-houses of Askhabad, Bokhara and Samarkand. The brick tea received at Novorossisk and Batum (2,226 tons and 6,403 tons, respectively, during the past seven years) is of poor and cheap quality, and is imported in this form.

The tea that comes into this district by sea is brought by the steamers of the Russian Volunteer Fleet, a line that runs from Vladivostock to Odessa, via the Suez Canal, and the item of tea is at present the most valuable part of the cargoes of the ships coming west. It is estimated that about 75 per cent of the tea imported into this district comes direct from China, and practically the remainder from India.

The consumption of tea is not confined to any particular class, but from the prince to the peasant all the people are tea drinkers, and the use of coffee and cocoa is not in any manner so universal, being, in fact, almost unknown outside the cities and larger towns.

Owing to the almost semi-tropical climate that prevails in this part of the Black Sea region, frequent attempts have been made to cultivate tea in paying quantities, and the Russian government at its experimental station located

here, under the title of the Imperial Domains Estate, has for several years past cultivated tea in considerale quantities, the growth and preparation of tho tea being under the supervision of Chinese brought hore for that purpose.

A large firm of Moscow merchants also have a tea plantation located here, that for several years did a considerable business in raising and selling tea; but during the past year, owing to financial difficulties and the unsettled condition of the country, this plantation has not been worked to any extent. In addition to these two estates a number of owners of lands along the Black Sea coast, immediately to tho east of Batum. are raising tea in small quantities, which is sold in the local market at a reasonable figure, and the prediction is frequently expressed that when conditions permit and tho small land-owners become educated in tho proper method of its raising and curing, a considerable portion of the tea consumed locally will be of home production.

A trial shipment of 40 chests, containing some 2,000 pounds of Batum tea, was sent to the United States some little time ago, but no further shipments have been mado.—*Spice Mill* for April.

THE CASHEW TREE.

In the *Kerala Sanchari*, a Malayalm paper published in Calicut, there recently appeared an interesting article showing that a stimulus has been given to the cultivation of the cashew-nut tree in the South Canara District and to the demand for the nuts, oil and othor products of the troe. It is said that this season alone merchants in Mangalore have purchased and stored up for export about 50,000 *moodas* of the unshelled nut—tho current prico of the nut being quoted at R2-2-0 a *mooda* of 42 seers. The product is shipped to Bombay, but it is also disposed of locally to some extent. An oil is expressed from the coriaceous covering, consisting of two layors, in which the kernel is enclosed. The price of the oil in Mangalore is said to be 10 annas a *kutti, i.e.*, about four quart bottles. In addition to the nuts and the oil, some export business is said to be carried on in confectionary prepared from the kernel of the nuts. In the country between Mangaloro and Nileshwar, ground which is considered unfit for othor crops is now being planted with cashew.

I hear that during the past two or three years an impetus has been also given to the export of cashew nuts from the port of Cochin, the produce being drawn from neighbouring portions of British Malabar and the States of Cochin and Travancore. The Cochin shipments are understood to go mostly to Europe direct. All these details indicate a growing foreign demand for products whose economic value has hitherto been very indifferently appreciated on tho West Coast.

Along the strip of coast country from the northern limit of South Canara right down to the southernmost extremity of Travancore, the cashew tree is one of the most familiar features of the sub-arborescent vegetation. In portions of the Ponani Taluq of Malabar, and in several localities in South Canara, Cochin and Travancore, extensive groves of cashew may be met with, stretching sometimes for miles together. The native name of the tree is *Feringhee* mango, and it derived this appellation presumably from the fact that it was introduced into this country from its native habitat, the West Indies, by the Portuguese, who were also instrumental in acclimatising the tree in Ceylon, where it may almost be said to run wild in many areas. The cashew tree (*Anacardium occidentale*) is without doubt one of tho hardiest members of the vegetable kingdom, thriving well on almost every conceivable description of soil. Its drought-resisting properties are especially remarkable. It is well able to take care of itself, and wants no watering, manuring or any other attention from man. But it may be assumed that, if systematically cultivated and tended, its economic possibilities would be considerably increased. It ordinarily comes to maturity and bears fruit in from four to five years, and is long-lived. The period of flowering and fruiting on the West Coast is the same as in the case of mango, and the crop is invariably an abundant one. The tree resembles the walnut in general appearance and the leaves give off a similar scent.

The cashew fruit is a kidney-shaped ash-brown nut on the apex of a yellow or crimson-coloured torus called the cashew apple, which latter, when ripe, is very succulent and somewhat tasty. In most parts of the West Coast, the apple is used as fodder for cattle, while in South Canara and Travancore, a strong liquor, considerably more intoxicating than coconut arrack, is expressed from the juice. In South Canara tho manufacture of this beverage is prohibited under the Abkari Act, though there is reason to believe a certain amount of illicit manufacture regularly goes on. In the hot season the apple is also largely consumed by the labouring classes, and in some of the towns it is hawked about for sale, several being strung together on a broomstick or a strip of some fibrous bark.

The covering in which the kernel is enclosed yields a thick black acrid oil, which possesses medicinal properties. A palatable edible oil, reckoned superior to European olive oil, is also obtained from the nuts, whose dried kernels, however, are mostly roasted, in which condition their flavour compares very favourably with that of almonds. It is said that the kernels are employed in Europe for the purpose of flavouring Madeira and that they are also mixed with cocoa in the manufacture of chocolate. Those facts doubtless account for the increasing demand for the kernels in Europe.

From the trunk of the tree a valuable gum exudes in stalactiform masses varying in colour from reddish to pale yellow. It makes a good varnish, is a tolerable substitute for inferior gum Arabic, and is also useful as an insecticide. The bark of the treo is employed by the natives as a tanning agent and also as an ingredient in certain medicinal preparations. The wood furnishes a good quality of charcoal, while the dried leaves, twigs and lesser branches are all patiently and regularly collected by the women of the poorer classes for fuel for domestic purposes. In several portions of the country there

has of late years been an increasing deficiency of jungle wood fuel for the poor, and the planting up of waste spaces, with such quick-growing trees as cashew, may be one means of averting the fuel famine which will be inevitable if tree-planting does not keep pace with the necessary evil of tree-felling. The cost of raising cashew is almost *nil*, and the planting of the trees on a large scale appears to be deserving of encouragement.—R.—*M. Mail*, June 3.

"AYAPANA," A FAMOUS MEDICINE.

Gammaduwa, 30th May.

DEAR SIR,—In answer to your request for information *re* Ayapana Eupatorium, about two-and-a-half years ago I had some correspondence with Mr. John Hughes, Agricultural Analyst, London, on this subject, and the information he kindly gave led me to increase the area under this cultivation as I had not a sufficient quantity growing to induce the trade to take it up. Mr. Hughes informed me the extract of the leaves contained chlorophyll, resin, and an oil of a pungent odour; and the query is, whether, if the extract were incorporated with hard fat, it might be used as an oinment for burns and sores, as the green leaves, when crushed and applied to a sore, act like a charm in cleaning it. The liquid from dried leaves, brewed as tea, is said to cure indigestion.—Yours faithfully,

JAMES WESTLAD.

MR. BAMBER'S LATEST RUBBER DISCOVERIES, &C.

PREPARATION AND PACKING—THE ENZYME FOUND ITS VITAL IMPORTANCE—MANUFACTURERS' VULCANISING EXPERIMENTS—HOW TO GROW CROTALARIA FOR RUBBER—A NEW SPRAYER AND PLOUGH.

[We make the following extracts, giving the important information Mr. Kelway Bamber has afforded to Ceylon planters, from an interview printed in the "Times of Ceylon." Mr. Bamber says:—]

"The Exhibition of September next will bring manufacturers and producers together with the view of a clearer understanding of the conditions prevailing on rubber estates on the one hand and the requirements of manufacturers on the other. It is expected that some new machinery for use on estates will be shown at the Exhibition.

It is impossible to say at the present moment which form of rubber is liked best. Biscuits must go—as an out of-date method they cost too much; some manufacturers will only take sheet, and others prefer crêpe. It is of the greatest importance to send home our rubber with a more uniform appearance, and more carefully sorted for manufacturers to count upon regularly getting rubber of the same appearance. Want of uniformity, both in consignments and in individual cases of rubber, frequently results in a lower price being obtained. If re-sorting at the docks were not done, the best rubber would sell at the valuation of the dirtiest sheets in the chest. This can easily be remedied by closer supervision.

"Another point with regard to the chests is the advisability of having the interior perfectly smooth and not roughsawn, as in the latter case the chips frequently become embedded in the rubber, necessitating prolonged washing and treatment to clean it. Very careful drying, and packing in a dry part of the factory would help to minimise this. Experiments are going on to decide whether a perfectly air-tight chest is detrimental, as the rubber in such chests seems to be more liable to become consolidated."

"Another method it is advisable to try on all estates is the

DESTRUCTION OF THE ENZYME

which occurs in the latex, together with certain organic products which darken on exposure to air. The enzyme has a very similar effect to the enzyme in tea. Unless this is destroyed early in the manufacture or thoroughly removed by washing, variations in colour are bound to result in every day's out-turn, as it is impossible, under present estate factory conditions, to dry all the rubber under identical conditions of light, air currents and probably temperature. The sunlight through a window or crevice falling on parts of the rubber and not on other parts, or a draft of air, would tend to darken the colour; but the change would also be affected by the varying amount of enzyme present. The strength of the rubber is probably not affected, or only to a very slight extent, by this variation in colour; but a pale rubber is preferred for many superior articles, especially articles for medical use.

"Early last year I filtered latex through porcelain in a vacuum, and obtained the perfectly colourless watery part of the latex containing all the soluble matter naturally present. On exposing this liquid to air I noticed that within a few minutes a rapid darkening took place, which pointed to the presence of an active oxidising enzyme, and this I confirmed by other tests. It was evident that, if this enzyme could be destroyed, or removed together with most of the soluble matter, paler rubber should result. Experiments showed the temperature at which the enzyme could be destroyed, and it only remained to get experiments done on a large scale on some estates, for which arrangements were made before I left for England in December. Rubber treated in this way has fetched the top price at several recent sales, and the fact has attracted considerable attention. The heat must be applied long enough to thoroughly penetrate a non-conducting material, for the destruction of the enzyme only on the surface of the sheet is useless.

"Two or three firms of manufacturers have promised to vulcanise rubber drawn under different experimental conditions, such as varieties of tapping, different intervals between tapping, latex preserved for different periods; latex from different ages of trees, &c., and furnish detailed results regarding the strength and

quality. This is the only means of satisfactorily testing rubber, there being no marked chemical difference in samples possessing considerable physical difference.

"The use of rubber tiling is likely to greatly extend on ships, in churches, banks, and residences. Heavier tyres for commercial motors, which are rapidly growing in favour, should also utilise much of the higher grades and should make up for the temporary falling off in the demand for private cars. . . .

CROTALARIA AND RUBBER.

"To be effective, crotalaria must be sown as soon as possible after the land has been burnt or cleaned; and the weeders sent over to remove the weeds in the ordinary way, taking care that the crotalaria plants are left alone. After a month's growth crotalaria is well established, but it is still advisable to have another weeding. By this time the crotalaria should cover the ground, and effectually prevent the growth of weed-seedlings. When five or six feet high and flowering, the crotalaria could be chopped down and mulched round the rubber trees, three feet from the stem. At least six feet up each row should not be planted with crotalaria at all, as it is advisable to have that area clear throughout. At each cutting of the crotalaria, which would probably be three or four times a year, the mulch can be laid in wider circles, and will effectually prevent the growth of anything underneath it. While growing, the crop of crotalaria will evaporate far more moisture from the soil and from a deeper layer than can be hoped for by any amount of exposure to the sun; and the mass of humus that forms from the decaying mulch will do more to maintain the soil in a state of humidity for a free flow of latex than any other system of cultivation. In my opinion it is not sufficiently realised that, when the trees come into bearing, the soil must be in a condition to retain moisture in an easily-available condition, if a constant flow of latex is to be obtained, and for the renewal of bark the soil must be in a suitable condition for effective root-development. A herbaceous crop that will in itself die out or can be easily destroyed is better than trees which would have large roots to decay in the soil. I am no advocate of a neglected condition of the estate, but I believe in utilising the space between the trees to grow organic matter for the future benefit of the rubber.

"With regard to lalang—this, of course, should be prevented from starting; or eradicated if present. When in England I visited the manufacturers of spraying machines which are now so largely used for destroying charlock and other weeds, and have brought out with me an apparatus which can be fitted to any cart, and on level land will effectually spray 20 to 30 acres a day. I propose testing this at Gangarnwa, and again on lalang in the Straits. The arsenite of soda suggested by Mr Carruthers will be used. If this machine succeeds, it should considerably modify the cost of weeding. The sprayer is made by Messrs. Mackies, Reading, costs from £10 to £12 out here, and can be fitted to any cart. The makers have kindly supplied the pump for the experiment. I have also brought out, through the kindness of Messrs. Ransome, Sims and Jeffries, a new form of disc plough, which will not be so liable to injury from roots, and does excellent work in other countries on newly-cleared land. The plough will be experimented with on land suitable for animal traction. The ploughs can be had with as many discs as one likes, requiring from two to eight bullocks to draw."

AN ARTIFICIAL RUBBER.

The following circular has reached every mercantile waste paper basket in Colombo (being sent everywhere except, of course, direct to the local press), and appears to have reference to *an accomplished fact*, but one in which local firms are not interested. One of the many has come our way—rescued from the limbo of lost things, to which planters doubtless trust this Artificial Rubber may be eventually consigned:—

"GREAT SCIENTIFIC TRIUMPH."

"ARTIFICIAL RUBBER."

"Artificial Rubber" manufactured by our Secret Trade Process is the Acme of Perfection. It has been submitted to most Exhaustive Tests, Analyses, etc., by eminent Experts and pronounced identical and undetectable to Genuine Rubber, and declared "Actual Rubber" although it does not contain a particle of "Natural" "Recovered" "Treated" or "Reclaimed Rubber," but is made direct from Raw materials and Chemicals only. The product is of Proved Excellence, Merits and Success and is easily manufactured, the Plant necessary being very inexpensive, no special Apperatus or Machinery whatever required, the materials being all common and easily purchased in un limited quantities. The cost of the manufactured product is very cheap and the profits enormous even if sold at 50 per cent below the current Market Price of Rubber. We are open to grant Licenses for the Monopoly Manufacture. Further particulars on application.

A slip is also enclosed with it, on which we read the following:—

"We are the original Inventors of the Scientific Working Formulas for most of the Highest Grade Qualities and Standard Brand Products, as supplied in immense quantities to the various English and Foreign Governments, Chief Railways, Docks, Shippers, Corporations, Industrial Firms, &c."

TROPICAL PLANTS FOR EGYPT.

Mr. D'Abaza, the Russian Consul at Alexandria, who is a member of the Horticultural Society of Mauritius, has just received a collection of seeds of tropical trees and shrubs from that society. He proposes to give an assortment of these seeds to residents in Egypt, interested in horticulture, and particularly to those who are interested in the acclimitisation of tropical plants into this country. There are some seeds of the famous baobab tree of Central Africa. (Adansonia digitata). This is the largest tree and probably the longest lived in the world. In Senegal these trees have attained at least six thousand years.

A further batch of seeds, confined entirely to specimens of tropical fruit trees, are arriving at Alexandria from Mauritius towards the end of the autumn.—*Egyptian Gazette*, May 26.

NEW CONGO RUBBER CO. IN FRANCE.

Le Caoutchouc des Herbes Soc. Anon. has been formed in France to extract rubber by the Bigéard process from various plants discovered in the Congo region. The capital is 300,000 frs. in 3,000 shares of 100 frs., and the head office is at 1, Rue de la Mietrodière, Paris.—*India Rubber Journal*, May 4.